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ABSTRACT

To be used by sixth grade teachers in preparing their classes for the Multnomah County, Oregon, Outdoor School Program, the guide to the Student Preparation Workbook provides general information, descriptions, game materials, and answers to exercises and puzzles. The guide is divided into four resource areas: soil, water, plants, and animals. Each section consists of introductory information, a glossary, and various learning activities and games. Although the material is not organized into complex lesson plans, there are suggestions for use of the activities. Some general environmental material is included. (SB)

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TEACHER'S GUIDE
FOR STUDENTS PREPARATION WORKBOOK
FOR OUTDOOR SCHOOL ATTENDANCE

MAY 1979
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INFORMATION, DESCRIPTIONS AND ANSWERS TO QUESTIONS AND PUZZLES

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December 1978

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

ENVIRONMENTAL MANNERS

Outdoor School has now completed 10 years of operation with nearly 60,000 6th graders having participated. Since 1966 we have rented seven youth camps as sites for Outdoor School and have maintained the best of relations with camp owners due to our care of the land and facilities. The continuing availability of the five sites we now use depends on the future care we demonstrate.

Students bound for Outdoor School need to know some basic outdoor manners if they are to help us in maintaining these five camps. Following are four composite pictures showing some people displaying a variety of bad environmental manners.

We hope the teacher will find these pictures useful in defining bad environmental manners. A classroom discussion using the pictures (perhaps as a test) will help prepare your students for a successful week at Outdoor School and preserve these camps for the many students yet to come. Following are possible answers.

1. Littering
2. Indiscriminate picking of plants
3. Carving or defacing trees
4. Hollering - frightening animals
5. Ignoring others - snaping limbs behind
6. Throwing polaroid film away
7. Throwing things
8. Disrupting bees nest
9. Disrupting student taking sample
10. Climbing trees to hide
11. Wading into pond to take sample
12. Leaving an open fire
13. Three abreast on trail
14. Stepping on plant specimens
15. Running - accidents happen
16. Leaving group behind
17. Walking with hands in pocket
18. Trampling animals and plants
19. Provoke pets to attack wild animals
20. Break glass - so sun can start fire
21. Throw things where others can get hurt
22. Handling animal young or eggs
23. Carrying away animals - in cage
24. Throw cans, bottles, etc. in pool
25. Walking too close to someone
26. Cutting across a switch back
27. Tearing moss or bark off stumps, logs
28. Chasing others with snakes, etc.
29. Beating down the foliage
30. Digging up plants

A STUDY OF WATER

GENERAL INFORMATION:

Water is our most valuable renewable resource. Every form of life needs it to survive. Man finds far more uses for water than any other animal on earth. We need water for industry, irrigation, recreation, transportation, drinking and many other home uses. Water is so important to us that many of our cities and industries have been built next to large rivers, lakes or the ocean. We have built large dams to store the energy of flowing rivers to provide electric power and water for irrigation in dry farming areas.

The freezing and thawing of water helps break rocks into smaller particles that eventually become soil. Water helps take nutrients down into the soil so plant roots can use them. Water in the soil is used by plants to manufacture food. Animals also need water to live.

Where does all of our water come from? Actually, we have three sources of water:

(1) evaporation from oceans, lakes, rivers and snow masses
(2) transpiration from the plants that cover much of the earth
(3) evaporation from land areas that contain moisture

As the sun warms the earth, evaporation takes place, much like a tea kettle producing steam that disappears as water vapor into the air. Warm air will accept and hold more water vapor than cold. Warm air rises, carrying with it water vapor. As the warm air rises to an altitude with less air pressure, it expands and cools, causing the water vapor to condense (become visible) in the form of clouds. As the condensed water vapor becomes super-cooled, it forms around tiny particles of dust, smoke, salt, etc., and freezes into an ice crystal. These tiny ice crystals grow into snowflakes and, as they gain weight, fall out of the clouds. If the air is cold all the way to the ground, precipitation occurs as snow. If the snowflakes fall through warm air and melt, then fall through cold and freeze again, we have sleet. We have hail during thunderstorms when the snowflakes or drops of water are carried back up into the freezing cloud by the violent winds that occur during thunderstorms. They freeze, fall, partially melt and are carried back up again and again until hailstones are formed which are so heavy that the updraft can no longer carry them back into the cloud. Some hailstones may reach the ground as large as softballs. Here on the West Coast, our evaporation water from the ocean comes to us from around the Aleutian Islands. On the other side of the Rocky Mountains, most of the oceanic water vapor is carried north from the Caribbean Sea and the Gulf of Mexico.

In one of these forms of precipitation (rain, sleet, snow, hail, etc.) water will reach the ground. Some of this water soaks into the ground and the rest flows over

the land's surface into streams, lakes, and into the ocean. This water is called runoff. The cycle from the air to the land and back to the air again has no beginning or end and is known as the "water cycle".

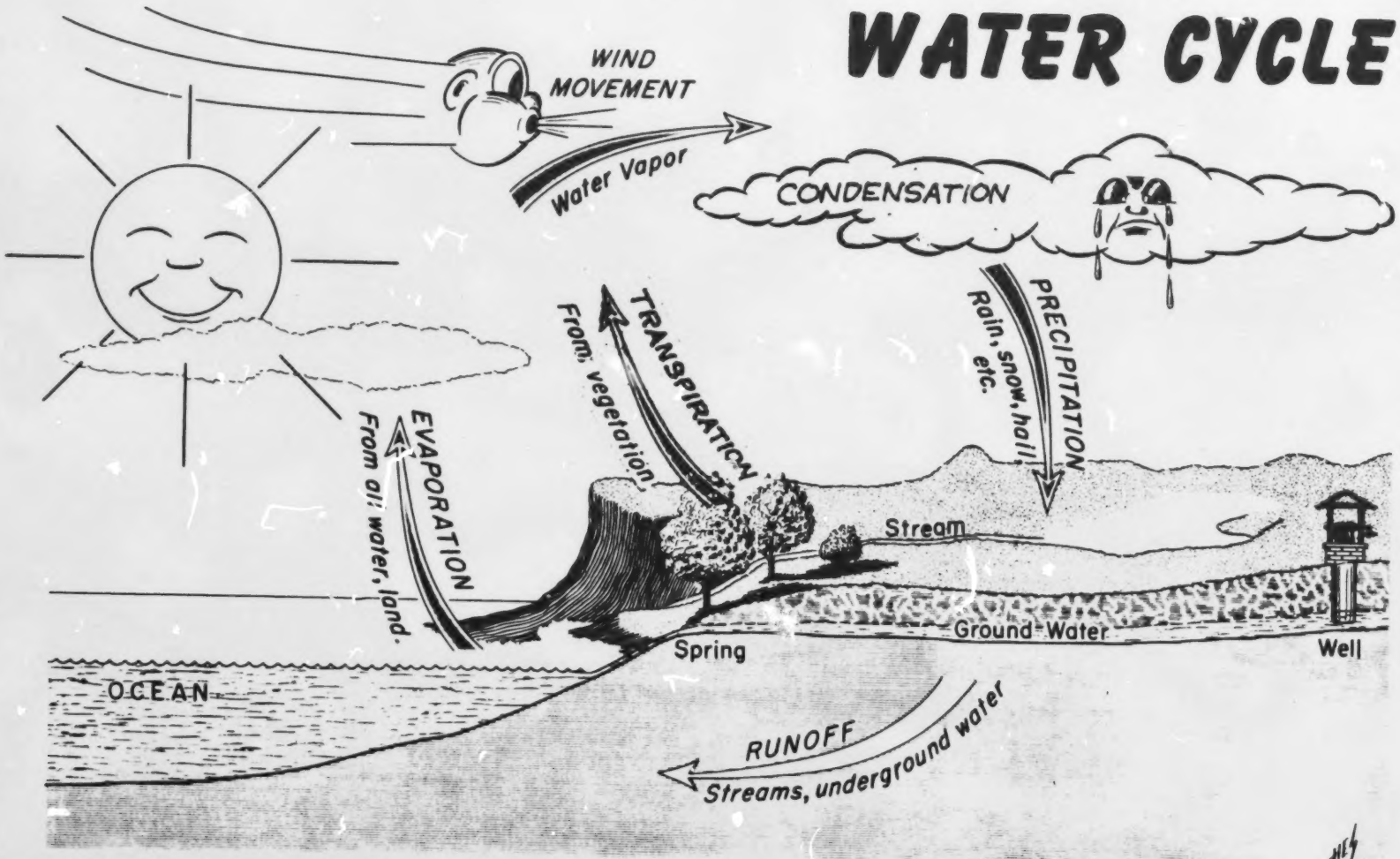
Some rainfall sinks into the soil as gravitational water and becomes our underground water supply. It is stored in the spaces between particles of soil and rocks. Actually under our country and buried in our soil lies a vast underground "lake" of fresh water that is known as ground water. This underground "lake" has a surface that is called the water table below which the water is more concentrated. When the water table comes to the surface in low spots we have streams and lakes, and the water there is known as surface water. When we dig a hole from the top of the ground down to below the water table we create a well. The deeper the well the more water from the surrounding soil flows into it -- until we reach the impervious bedrock, or until it starts to cave in. Excess water that drains from the surface as well as underground, down to the ocean is also called runoff! Other ground water may be taken up through plant roots to supply them with food from the soil. This water that the plants can use is called capillary water. The third kind of ground water is called hydroscopic water. It forms such a thin film around soil particles that it is impossible for the plants to take it up in their roots.

The soil is the greatest reservoir or storage place we have for our fresh water supply. Snow packed in the mountains is the next largest storage place, followed by natural lakes, man-made lakes and ponds. Water in ponds, lakes and streams contain bacteria, plants and animals, just as the land supports many different kinds of plant and animal life.

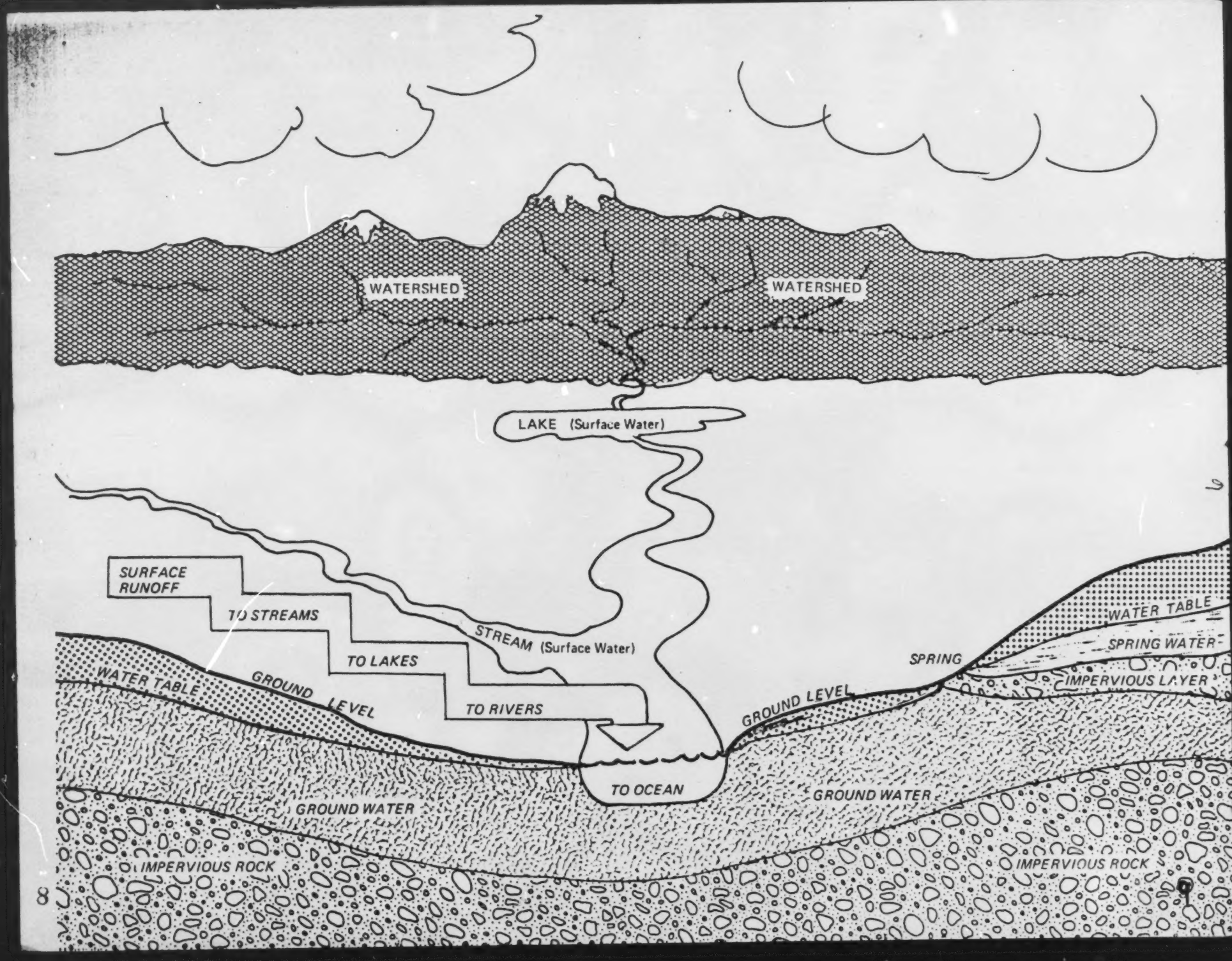
The difference in the plants and animals that live on land and those in the water, is that the life forms found in water are able to survive with very little oxygen. The oxygen is dissolved in the water and it is difficult to separate the two. Water is such a heavy substance that aquatic plants and animals depend on it for bouyance and ease of movement. (For example, have you ever noticed how easy it is to lift objects or raise your arms and legs under water?) Land animals, however, have had to develop legs for support or develop the ability to fly in the extremely light substance of air.

More water is used in agriculture than in any other industry. Much of this is used for irrigation, but natural rainfall provides water for many of our crop plants. Some of the water that plants use is lost through process called transpiration. Transpiration is the loss of water from leaves, stems and needles through evaporation. Transpiration in plants is like perspiration in people. Plants lose hugh amounts of water through this process. For example, corn can lose up to 1,296 tons of water per acre every year!

WATER CYCLE



WATER COMES AND GOES FROM EARTH TO SKY IN AN ENDLESS CYCLE


WATERSHED
WATERSHED
LAKE (Surface Water)
SURFACE RUNOFF
TO STREAMS
TO LAKES
TO RIVERS
STREAM (Surface Water)
WATER TABLE
GROUND LEVEL
TO OCEAN
GROUND WATER
IMPERVIOUS ROCK
SPRING
WATER TABLE
SPRING WATER
IMPERVIOUS LAYER
GROUND LEVEL
GROUND WATER
IMPERVIOUS ROCK

WATER WIZARDRY ANSWERS

WATER AND YOU:

A. LIST 5 WAYS IN WHICH YOU USE WATER AT HOME:

1. Washing dishes
2. Bathing
3. Watering the lawn
4. Cooking
5. Drinking
   etc.

B. LIST 5 RECREATIONAL ACTIVITIES THAT OCCUR NEAR OR IN WATER:

1. Swimming
2. Water skiing
3. Surfing
4. Boating
5. Fishing
   etc.

C. NAME ONE WAY IN WHICH INDUSTRY USES WATER:

In manufacturing it is used to clean things, to cook things, to take waste products away, to cool machines.

D. WHAT USE OF WATER IS THE PACIFIC NORTHWEST ESPECIALLY DEPENDENT UPON?

For electric power generation. Most of the Northwest's power is water generated. Over the United States most is generated in steam plants fueled by coal, oil or gas.

E. HOW MANY GALLONS OF WATER DO YOU THINK THE AVERAGE U. S. CITIZEN USES PER DAY? 75 GALLONS PER DAY.

WATERSHED:

A. WHAT IS A WATERSHED AND HOW DOES IT WORK?

All land drains water into streams, rivers, lakes or oceans. Each area of land that drains water into a main stream above it is a watershed. The stream into which the water drains is usually named the same as the watershed. A watershed stores water in a natural way, in much the same way as man stores water in reservoirs. Watersheds store water in snow, in streams, in lakes, in plants, in soil and underground.

B. FIND THE BULL RUN RIVER ON A MAP. WHO USES THE WATER STORED IN THE RESERVOIRS? (USE A RECENT OREGON ROAD MAP AND SEARCH DUE EAST OF PORTLAND)

Portland Area

WATER WIZARDRY ANSWERS (continued)

C. HOW MANY RESERVOIRS ARE THERE? 2 (3 DEPENDING ON MAP DETAIL

D. MAKE A GUESS AS TO HOW MANY TIMES PER MONTH WATER QUALITY TESTS ARE MADE ON THE RESERVOIRS 500 TIMES PER MONTH.

TYPES OF PRECIPITATION:

A. WHAT IS OREGON'S MOST COMMON FORM OF PRECIPITATION? RAIN

B. WHAT IS IT CALLED WHEN RAINDROPS FREEZE BEFORE HITTING THE GROUND? SLEET

C. WHAT IS IT CALLED WHEN WATER VAPOR FREEZES BEFORE IT TURNS INTO DROPLETS? SNOW

D. WHAT IS IT CALLED WHEN WATER VAPOR TURNS INTO DROPLETS BEFORE IT RISES INTO THE AIR FROM OFF THE GROUND? DEW

E. WHAT IS IT CALLED WHEN WATER VAPOR FREEZES AT THE GROUND LEVEL? FROST

F. WHAT IS IT CALLED WHEN A CLOUD FORMS CLOSE TO THE GROUND? FOG

G. DURING A THUNDERSTORM, SNOWFLAKES OR RAINDROPS ARE CARRIED UP INTO FREEZING CLOUDS BY STRONG WINDS. UP IN THE CLOUD, THEY FREEZE, FALL, ARE CARRIED BACK UP BY THE WIND, FREEZE, FALL, ETC., ETC. IN THE PROCESS, THEY BECOME LARGER AND LARGER UNTIL THEY ARE TOO HEAVY FOR THE WIND TO CARRY. THEY FINALLY FALL TO THE EARTH.

WHAT FORM OF PRECIPITATION IS THIS (HINT: THEY CAN GET AS BIG AS SOFTBALLS) HAIL.

WATER STORAGE:

A. SOMETIMES WE HAVE TOO MUCH WATER ON THE GROUND AND IT IS CALLED A FLOOD

B. SOMETIMES WE HAVE TOO LITTLE WATER OVER A LONG PERIOD OF TIME AND IT IS CALLED A DROUTH

C. HOW DOES MAN TRY TO CONTROL WATER STORAGE TO PREVENT THE ABOVE?

1. RESERVOIRS BEHIND DAMS
2. IRRIGATION
3. FLOOD CONTROL PROJECTS
4. DRAINAGE PROJECTS

D. HOW DOES NATURE STORE WATER?

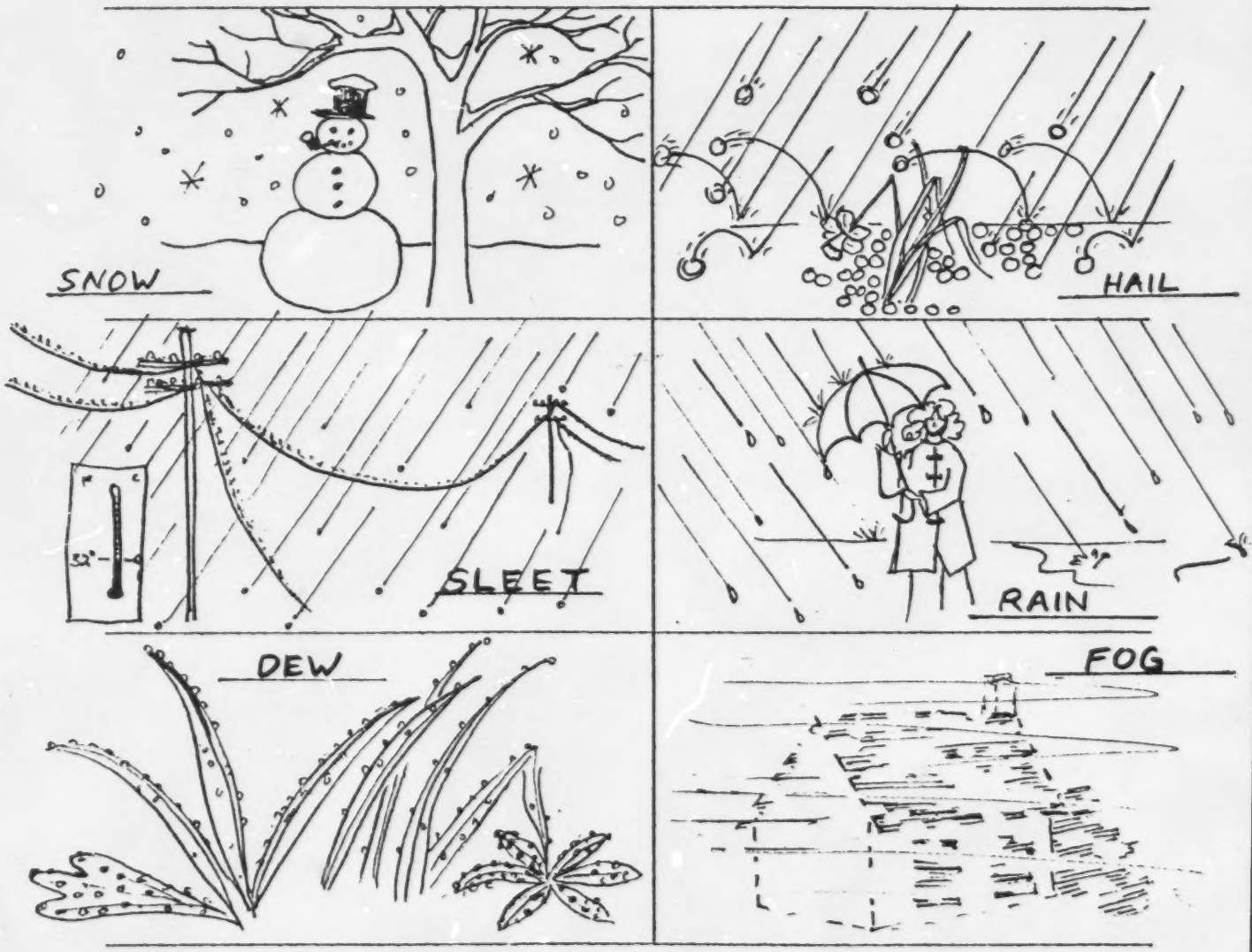
1. OCEANS
2. LAKES & STREAMS
3. SNOW — AND ICE IN GLACIERS
4. IN AREAS WITH ABUNDANT PLANT LIFE
5. GROUND WATER
6. IN THE AIR (EVAPORATION, TRANSPIRATION, CONDENSATION PRECIPITATION)

MIX AND MATCH

LABEL EACH FORM OF PRECIPITATION

HERE ARE THE POSSIBILITIES:

Dew	Fog
Snow	Hail
Rain	Sleet



MATH PRACTICE PROBLEMS

While you are at Outdoor School studying water, you will be doing some math problems while studying the stream. These problems will give you some practice.

1. We measured the depth of a stream in three places. We need to know the average depth. Find the average depth by using the measurements below:

   First Measure _____ 5 feet 7 inches

   Second Measurement _____ 6 feet 1 inch

   Third Measurement _____ 3 feet 4 inches

   AVERAGE DEPTH = 5 FEET

2. We have a distance measured off of 10 feet. We dropped a leaf or a twig into the water and timed it with a stopwatch to see how long it took to float 10 feet. The stopwatch recorded 2 seconds to time. Now find out how many feet the leaf floated each second.

   THE LEAF FLOATED 5 FEET PER SECOND

3. We found out that there were 270 gallons of water flowing each minute in our stream. What we want to know now, is how many gallons of water flow in our stream each day. How would you figure this out?

   MY ANSWER IS 388,800 GALLONS OF WATER PER DAY

4. Now we need to know how many people our stream can support in 24 hours or one day. You have (from #3) the amount of gallons per day. Each person uses about 75 gallons of water per day. Figure out how many people our stream can support.

   TOTAL NUMBER OF PEOPLE = 5184

AN AQUATIC ANIMAL --- THE CRAYFISH

One of the most interesting shellfish found in Oregon is called the "crayfish", "crawfish", or "crawdad". These fearful creatures can be found living on the bottom of almost any freshwater lake or stream. Their principal food is aquatic plants but they will also eat animals, dead or alive, which makes them scavengers. Animals that eat both animal and plant food are also called omnivorous. Crayfish are most active at night to avoid predation by such animals as large fish, raccoons, or man. Crayfish are predators too. How?

The crayfish has a hard exoskeleton (skeleton on the outside of its body), reddish-brown in color which covers the entire body and helps protect it from other animals. At the joints the exoskeleton is thin and soft to permit movement. The crayfish can move in all directions on four pairs of stick-like legs, the front two of which have small claws. When the crayfish is alarmed it can propel itself quickly backwards through the water by flipping its tail underneath its body in successive jerks. The crayfish has gills which enable it to live its life underwater. However, it can live out of water for short periods of time if the gills remain wet. The two larger front "arms" are tipped with oversize claws used for defense and to tear and hold food.

Reproduction in crayfish is unique: the female attached her eggs with a sticky jelly-like substance under her tail where they hang like berries and are aerated by movement of fan-like swimmerets under the tail. Depending on the temperature, it takes five or more weeks for the eggs to hatch. Each young is a minature crayfish and is about the size of a pencil point when hatched. Like most shellfish, the crayfish must molt, or crawl out of its rigid outer shell in order to grow. After molting, new shell material is oozed out of its body taking about five days to harden to supply a larger "home" for its body. During this time Mr. Crayfish is soft and vulnerable. Adult crayfish may grow to seven or eight inches long, demanding dozens of molts.

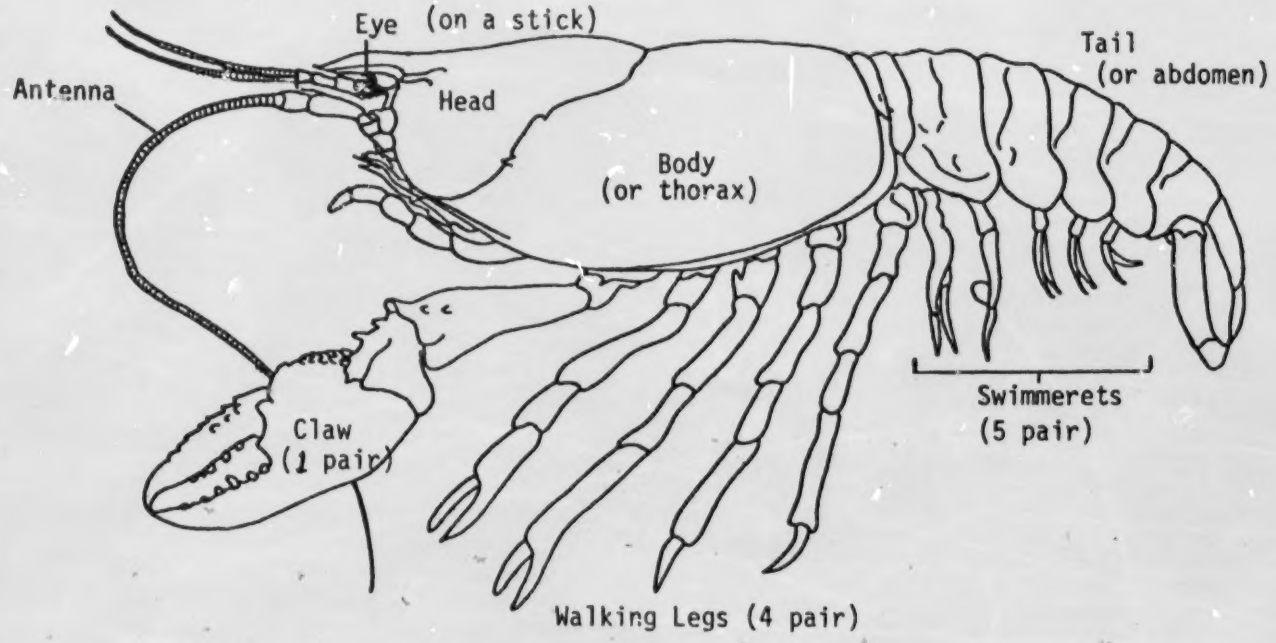
The crayfish has the ability to replace lost parts of its body such as a claw, a leg, or an eye. This ability of regeneration is greater in the young animals than in older ones. Upon loss or removal of an appendage, the new one is partly formed at the next molt, then increases in size with successive molts until restored.

Crayfish are important in that they help clean up the dead animals on stream and lake bottoms. The meat of the crayfish is delicious and can be boiled and eaten. Another member of the crayfish family that lives in salt water is the lobster.

//

THE CRAYFISH

The stream you will be observing on water study may be the habitat for the crayfish pictured below. By studying the animal's parts and answering the questions you may find out where to look for the crayfish, what it eats and the niche it fills in its habitat.



What purpose do you think the antenna have, especially at night and in muddy water?

SENSING & LOCATING FOOD - HIDING PLACES

What animals might eat crayfish? LARGE FISH, RACCOONS, OTTER, HERONS, CRANES

How would the crayfish use its big claws? FOR DEFENSE & HOLDING FOOD

What purpose do the small claws on the walking legs serve in a fast-flowing stream?

HELP HOLD THE CRAYFISH ON THE BOTTOM

In which direction would the crayfish move if alarmed? Indicate on your drawing:

→

During molt Mr. Crayfish is open to predation. What do you think he does during this time? HIDES Where UNDER ROCKS AND DEBRIS

Why is the crayfish more active at night? HIS ENEMIES CANNOT FIND HIM EASILY

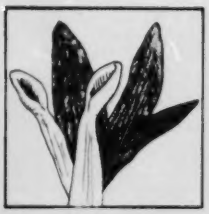
How might a crayfish lose a leg? IN FIGHTING OR ESCAPING AN ENEMY

His salt water cousin is called a? LOBSTER

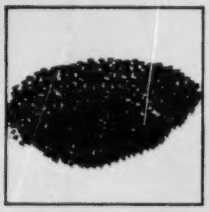
WATER IS A HABITAT FOR WATER-LOVING PLANTS AND ANIMALS

PLANTS

Cattail Along the edges of ponds with its roots in water-saturated soil



Skunk Cabbage In swampy areas with its feet in the water

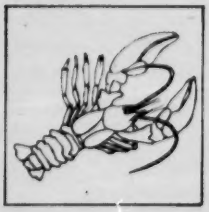


Duckweed Tiny plants that float on pond water with small roots hanging down

Water Lily In ponds with roots fastened to the bottom and leaves and flowers on the surface

Coontail In ponds growing on the bottom and remaining entirely submerged

ANIMALS



Crayfish Lives in water, gets oxygen from water through gills—has skeleton outside (exoskeleton)—eats plant and animal material—hides during days—limited mobility by crawling—quick escape mobility by flipping tail (backwards)

Fish Lives in water—gets oxygen from water through gills—eats animal material—highly mobile—swims to escape enemies

Snail Lives in water- gets oxygen from surface (some) or through gills (some)—eats plant material—low mobility on bottom and on plants (snail's pace)—hides in hard spiral shell

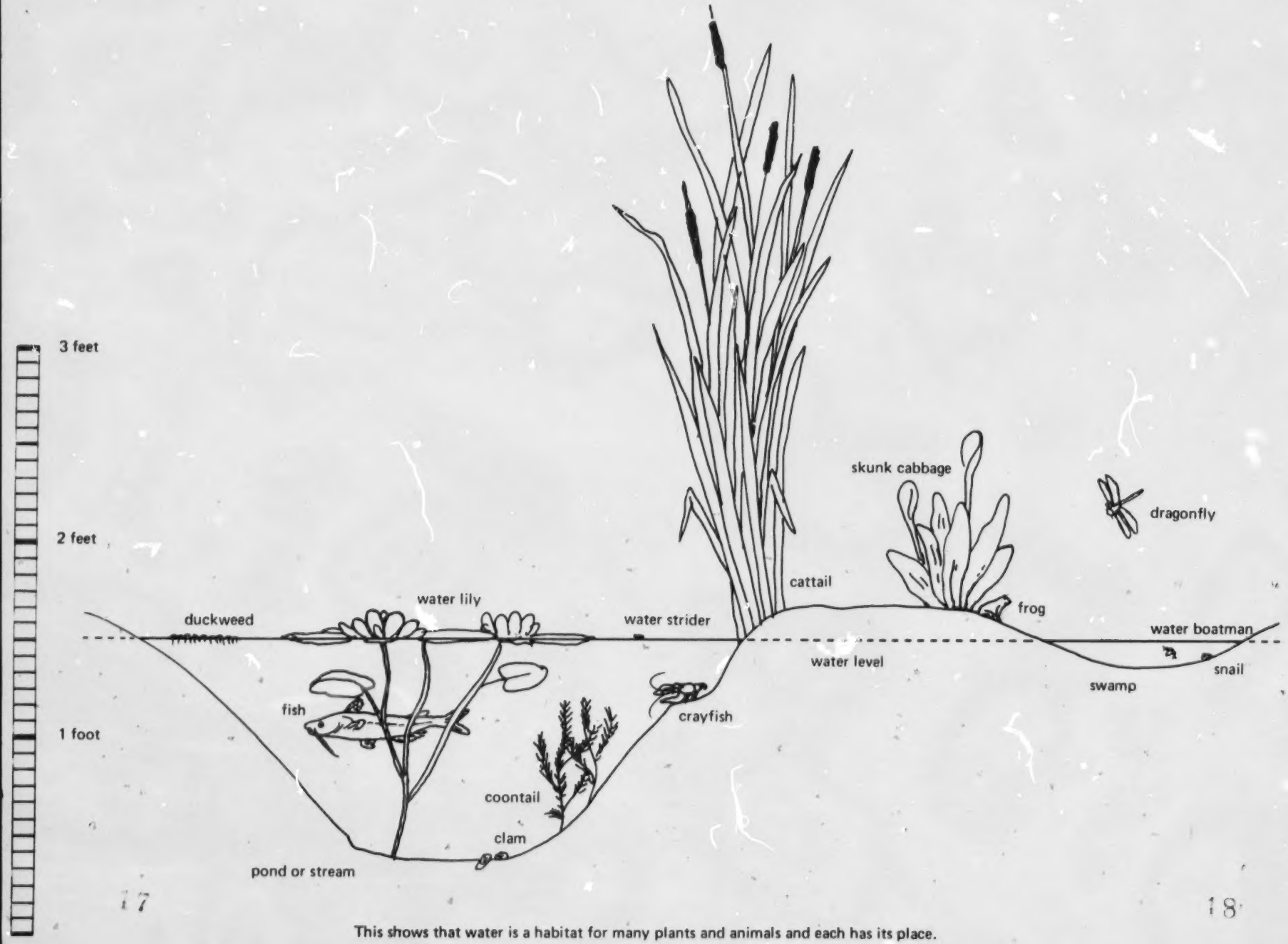
Clam Lives on or in the bottom of stream or pond—breathes and eats through a siphon by pumping water in one and pumping wastes out another—stationary—closes shell for protection

Water Strider Lives on the water surface (surface tension) and kicks swiftly along surface to escape enemies—catches other insects for food (predator)

Water Boatman Lives and feeds in the water but comes to surface for oxygen—eats algae or animal material sucked from the ooze on the bottom—fast swimmer swimmer to escape enemies

Frog Lives on land and water (amphibian)—eggs laid in water—tadpoles swim in water and breathe through gills—adults emerge to land and breathe through lungs

Dragonfly Adults fly but deposit eggs in water where nymphs hatch and breathe through gills but emerge onto plants to hunt prey (predator)



This shows that water is a habitat for many plants and animals and each has its place.

DISSOLVED OXYGEN IN WATER

The amount of useable oxygen (that is, the oxygen that the plants and animals in the water use to live) in the water is called dissolved oxygen (DO). It is measured in parts per million which is shortened to ppm. For example, if we found that the water had 8 ppm of dissolved oxygen, it would mean that in one million gallons of water, there would be 8 gallons of oxygen.

All life, both plant and animal, needs oxygen to live. Water gains oxygen from; rain (snow) falling through the air or splashing onto a water surface; from falling over waterfalls or riffles in streams, from wind-caused wave action or lakes and oceans, and from aquatic plants giving off oxygen in the daytime.

During daylight all plants both land and aquatic, use carbon dioxide (CO_2) and give off oxygen (O) in the photosynthetic process (manufacturing food). At night the reverse is true. Since there is no light, photosynthesis stops and plants use O and give off CO_2. Over a 24 hour period a plant gives off more O than it uses at night when the plant processes are slowed -a lucky event for us air-breathing humans!!!! Plants growing in water do the same thing and overall produce more O than they use. Still water with large amounts of plant growth will fluctuate the most in amounts of dissolved oxygen during 24 hours. There is a limit to the total amount of oxygen water can hold, depending on air pressure and temperature. At normal air pressure and at 50°F(11C)15 ppm is the most DO water can hold. This is called saturation.

Larger species of animal life in water (salmon, trout, crayfish) can survive when the dissolved oxygen is 5(ppm) or above; some smaller forms down to 4 ppm; a few unusual ones (catfish & carp) down to 2 or 3 ppm. Below that animal life disappears.

The Dissolved Oxygen in water can be reduced in several ways. Dead and decomposing plants and animals in water can use up more oxygen than produced when aerobic (air using) bacteria feed and multiply on the dead material. The more bacteria, the more oxygen used! Warm water will hold less oxygen than cold water. When the sun shines on reservoirs behind dams on rivers, the DO drops lower than that in the free flowing river (heat pollution). This has happened on the Columbia and other rivers, which we have dammed for electric power production. This has had a serious effect on salmon runs. Industrial heat discharged into rivers can cause heat pollution. Too many animals using dissolved oxygen in a body of water can lower the oxygen amounts, eventually causing the death of the animals. Toxic compounds from factories can kill plant life and remove the oxygen production by photosynthesis. Certain kinds of pollution from industry such as wood sugar from pulp mills can feed aerobic bacteria and they multiply until they use up the oxygen. This used to be true in the Willamette River before laws cleaned up the rivers.

DISSOLVED OXYGEN QUESTIONS

A. WHAT IS DISSOLVED OXYGEN? THE USABLE OXYGEN IN WATER - THAT WHICH IS AVAILABLE FOR PLANTS & ANIMALS

B. HOW IS IT MEASURED? IN PARTS-PER-MILLION (OR PPM.)

C. PLANTS OR ANIMALS CANNOT LIVE IN WATER WITH LESS THAN 2 PPM OF DO TO LIVE.

D. SALMON, TROUT AND CRAYFISH NEED AT LEAST 5 PPM OF DO TO LIVE.

E. UNDER NORMAL CONDITIONS DO SATURATION REACHED AT 15 PPM.

F. WHAT KIND OF THINGS TEND TO REDUCE THE AMOUNT OF DO WATER?

1. DECOMPOSING PLANTS & ANIMALS (BY FEEDING AEROBIC BACTERIA) (EUTRIFICATION)
2. HEAT POLLUTION (DAMS & HEATED INDUSTRIAL WASTES)
3. TOO MANY ANIMALS USING DISSOLVED OXYGEN IN WATER
4. TOXIC WASTES KILLING AQUATIC PLANTS
5. INDUSTRIAL WASTES THAT FEED AEROBIC BACTERIA (WOOD SUGARS)

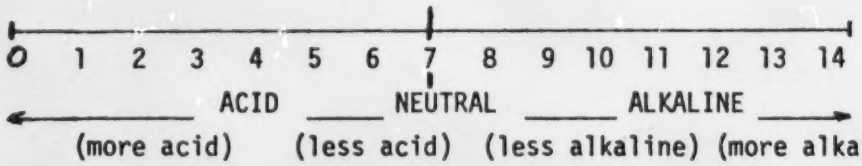
G. WHAT KINDS OF THINGS TEND TO INCREASE DISSOLVED OXYGEN IN WATER?

1. PLANTS IN THE PHOTOSYNTHETIC PROCESS DURING THE DAY
2. RAIN COLLECTING OXYGEN IN FALLING AND SPLASHING ON WATER SURFACE
3. FALLING WATER AT WATERFALLS AND RIFFLES IN STREAMS
4. WIND DRIVEN WAVE ACTION ON LAKES - OCEANS.

DESCRIPTION OF pH

pH is a scale of measure to indicate how acid (sour) or how alkaline (sweet) a plant or animal environment is. Aquatic biologists and soil scientists have developed test kits to give them this information. You will use such test kits at the Outdoor School to study plant and animal environment.

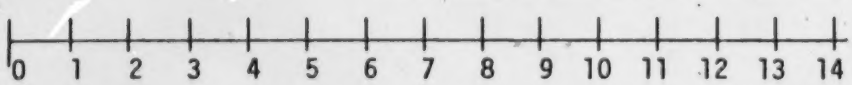
pH is measured in a scale of rom 0 (very acid) to 14 (very alkaline) with the midway point (7) being neutral, or neither acid or alkaline (sour or sweet).



To find pH, you will test a small sample of water or soil. When you finish the test, you will have arrived at a number. If the number is between 0 and 7, the water or soil is acid; if it is between 7 and 14, it is alkaline; if it is 7 it is neutral. It is more acid more alkaline the further the number appears from "neutral" (7) on the scale. You can test the pH of other things besides water and soil. On the pH scale below, you can see the pH reading of some common things that you might find in your home.

MORE ALKALI
14. ---------- PURE ALKALI (base)
13.
12. ---------- BAKING SODA
11.
10.
9. ---------- SOAP
8.
Neutral 7. ---------- PURE WATER, BLOOD
6.
5. ---------- SOUR MILK
4. ---------- ORANGE JUICE
3. ---------- LEMON JUICE, VINEGAR
2.
MORE ACID
1. ---------- PURE ACID

pH RANGES THAT SUPPORT AQUATIC (water) ANIMAL AND PLANT LIFE



6.5 ↔ 7.5 (Largest variety of animals, trout, mayfly, stonefly, caddis fly)

7.0 ↔ 9.0 (Snails, clams)

6.5 ↔ 8.5 (Bass, Crappie)

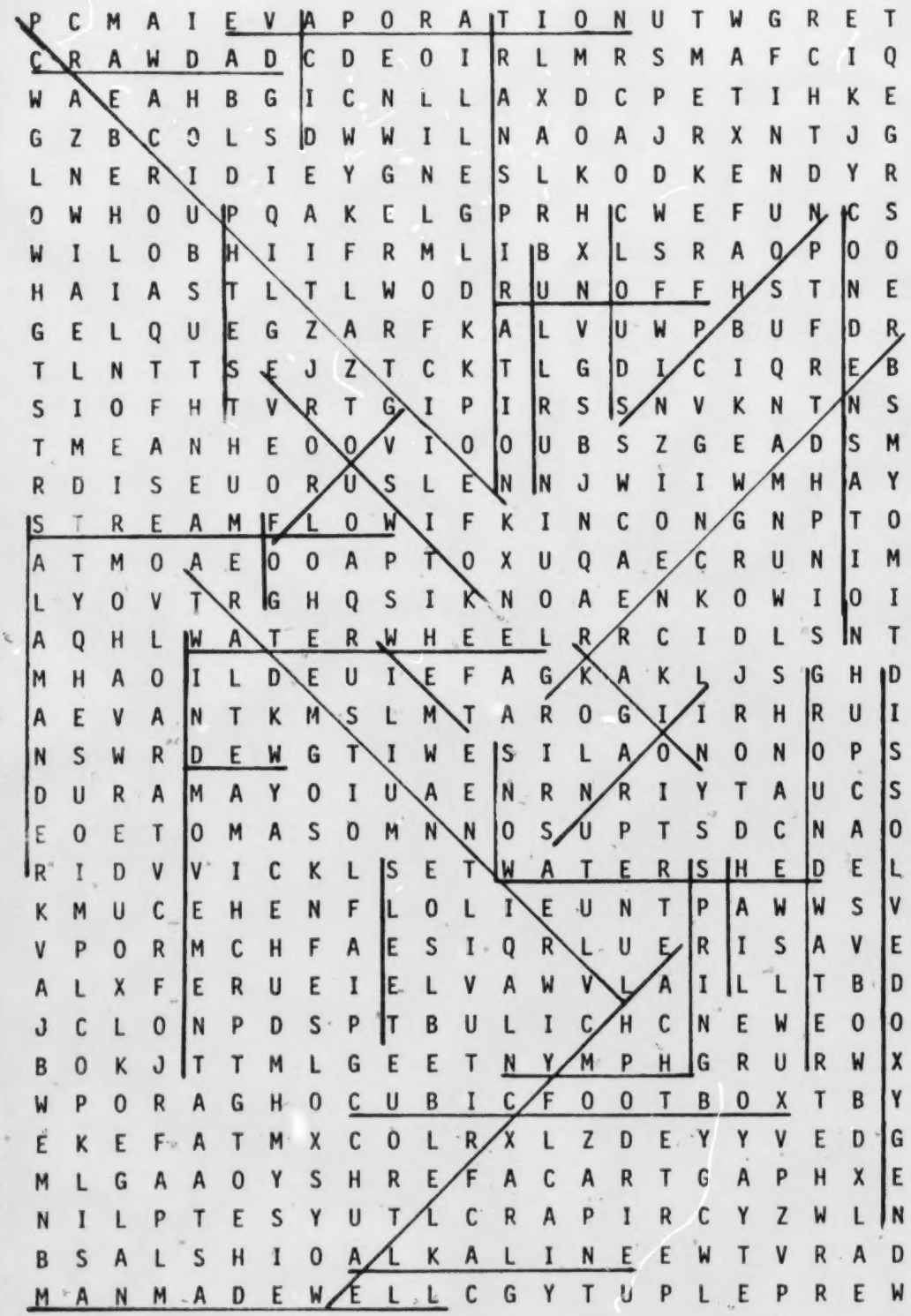
6.0 ↔ 9.0 (Carp, Suckers, Catfish, some insects)

6.5 ↔ 12.0 (Plants (algae, rooted, etc.)

1.0 ↔ 13.0 (Bacteria)

WATER WORDS PUZZLE

DIRECTIONS: Words may go up, down or diagonally. Circle the word when you find it.



(A) Acid, Alkaline, Artesian Well

(B) Bull Run

(C) Clouds, Condensation, Crawdad, Cubic Foot Box

(D) Dew, Dissolved-Oxygen

(E) Erosion, Evaporation

(F) Fog, Frog

(G) Green Water, Ground Water

(H) Hail

(M) Man Made Well

(N) Nymph

(P) pH Test, Precipitation

(R) Rain, Runoff

(S) Salamander, Siphon, Sleet, Snail, Snow, Spring, Streamflow

(T) Transpiration

(W) Water Cycle, Watershed, Wet, Waterwheel, Wind Movement

TEACHER: READ MIXED UP ITEMS AND HAVE STUDENTS PLACE IN PROPER SQUARES TO RIGHT OF TERM.

WATER STUDY

MIX AND MATCH

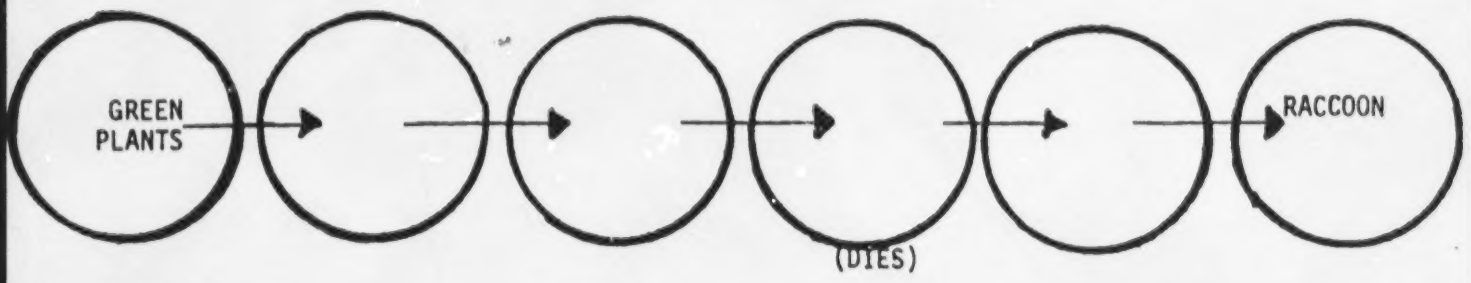
(Correct responses below)

SALMON	THIS IS AN EXAMPLE OF AN ANADROMOUS FISH	5 SPECIES FOUND ON THE WEST COAST	WAS ONCE A STAPLE FOOD FOR THE N.W. INDIAN	SPENDS MOST OF THEIR LIVES IN SALT WATER	THEY COMMONLY USE FISH LADDERS	THEY DIE AFTER SPAWNING
DISSOLVED OXYGEN	NECESSARY FOR ALL AQUATIC LIFE	POLLUTION DECREASES THIS	RAIN, PLANTS, & FALLING WATER INCREASE THIS	SALMON AND TROUT NEED AT LEAST 5 PARTS PER MILLION	EUTRIFICATION DECREASES THIS	REACHES SATURATION POINT AT 15 PARTS PER MILLION
CRAYFISH	A BOTTOM-DWELLING ORGANISM WHICH SHEDS SKELETON	A FAVORITE FOOD OF THE RACOON	BRIGHT RED AFTER COOKING, SOME PEOPLE CONSIDER THEM A DELICACY	IS BOTH A PREDATOR AND A SCAVENGER	EGGS ARE CARRIED ON FEMALE'S ABDOMEN	A NATURAL SANITARIAN
SWAMP	A BODY OF QUIET WATER	WATER FOUND HERE USUALLY TESTS TO BE ACID	AQUATIC ANIMALS FOUND HERE IN LARGE NUMBERS OF VARIETY	WATER HERE IS GENERALLY SHALLOW AND WARM	DUCKS & GEESE COMMONLY NEST HERE	
pH	A MEASURE OF THE CONCENTRATION OF HYDROGEN IN WATER	WHEN USING THIS TEST, WE FIND WHETHER WATER IS ACID/ALKAL.	MEASURED AS A SCALE WHICH RANGES FROM 1 TO 14	BACTERIA IS THE ONE THING THAT DOESN'T SEEM TO BE CONCERNED WITH THIS	THE LARGEST VARIETY OF ANIMALS ARE FOUND AT A LEVEL BETWEEN 6.5-7.5	WHEN TESTING A TYPICAL POND, THIS MEASUREMENT CAN CHANGE FROM FALL-SPR.
CADDISFLY	LIVES MOST OF ITS LIFE ON THE STREAM BOTTOM	BUILDS ITS HOME OUT OF SMALL PEBBLES & STICKS	IS A FAVORITE FOOD FOR FISH	SPENDS MOST OF IT'S LIFE IN THE LARVAL STAGE	SOMETIMES CALLED A "PERIWINKLE"	HAS A HEAD THORAX AND ABDOMEN
BASS	THIS ANIMAL IS FOUND IN WARM FRESH WATER	COMMONLY REFERRED TO BY THE SIZE OF ITS MOUTH	COMMONLY CALLED PAN FISH	AN EXAMPLE OF A SPINY-RAY FISH	FRESHWATER PREDATOR	
FROG	EGGS LAID IN THE WATER IN JELLY LIKE MASSES	A TAILESS AMPHIBIAN WHOSE HIND LEGS ARE ADAPTED FOR JUMPING/SWIMMING	THE YOUNG FORM HAS NO LIMBS OR TRUE TEETH	SOMETIMES FOUND IN TEACHER'S DESK AFTER OUTDOOR SCHOOL	IS A PREDATOR OF INSECTS	CHANGE FROM YOUNG FORM TO ADULT REQUIRES 2 WEEKS TO 2 YEARS
WATERSHED	THIS LAND AREA FROM WHICH DRAINS TO A GIVEN POINT	THIS AREA MAY INCLUDE FARMS, HILLS RANCHES, MTS TOWN, ETC.	THE MISSISSIPPI RIVER DRAINS ONE THAT IS 1,243,000 SQ, MILES IN AREA	NEEDS TO BE PROTECTED TO PREVENT POLLUTION, FLOODING, EROSION & SILTATION OF RESV.	A LARGE ONE IS MADE UP OF MANY SMALLER ONES	THE ONE PORTLAND DEPENDS ON IS 102 SQ. MILES IN AREA

WATER FOOD CHAINS

TEACHER SHOULD DRAW THE FOLLOWING DIAGRAMS ON THE BOARD AND WRITE DOWN CHOICES

EACH LINK DEPENDS ON THE ONE BEFORE IT. FILL IN THE BLANK CIRCLES WITH THE CHOICES BELOW THE CHAIN IN THE ORDER THAT THEY MAKE THE MOST SENSE.

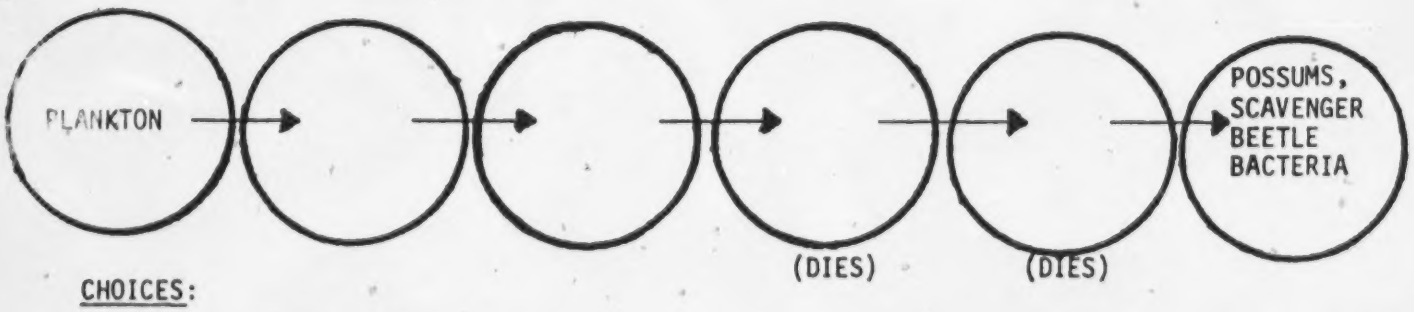


CHOICES:

1. CRAYFISH	Answers 4.
2. FROG	2.
3. BASS	3.
4. MAYFLY, NYMPH OR LARVAE	1.

IN THIS ONE, TWO OF THE LINKS DIE AND THEN ARE FED ON BY THE NEXT LINK.

2.



CHOICES:

CADDISFLY LARVAE	Answers 1.
OSPREY	3.
TROUT	2.
TURKEY VULTURE	4.

A STUDY OF SOIL

GENERAL INFORMATION:

The story of soil formation begins with solid rock. Through the ages, solid rock has been broken into smaller pieces by many kinds of processes. The freezing and thawing of water penetration by growing roots; moving water, ice, and wind; and chemical reactions with the rock minerals, all help to break up rock. These and other processes have formed the few inches of topsoil which support all life on our earth.

The darker topsoil is built up gradually from the subsoil below it by the addition of humus from decaying plants and animals. The subsoil layer is usually lighter colored and contains less decayed plant and animal material. It is usually more compact and clayey, light, air, and water do not penetrate it as rapidly. Therefore, subsoils are not as favorable to the growth of plants as is the topsoil. Between the lowest subsoil and the solid rock is a layer of parent material that is mostly raw rock fragments and minerals that are poor for plant use.

As you look around your Outdoor School study area, you may find soils that have different colors, some with more sand or clay than others, some with stones on the surface, etc. These differences can be caused by a variation in the kind of rocks and plants that have formed the soils. The slope of the land, the extremes of temperature, amount of rainfall, climate and the age of the soil may also make it different from other soils.

When you dig below the surface of the ground in several places at Outdoor School, you may be able to see how earthworms and other small animals help to grind up materials into finer particles as they eat their way through the soil. Of course, you will want to record the animals or signs of them that you find.

THINGS TO LOOK FOR IN A SOIL SAMPLE:

1. Color -tells about organic matter, drainage, current animals and plant life, and fertility.
2. Texture -the feel -- sandy, loamy, clayey -- tells water holding capacity and how easy or difficult the land would be to work with.
3. Structure -the shape -- blocky, platy, granular -- tells drainage ability, aeration, and water intake.
4. Depth -how deep in a soil one finds plant and animal life.
5. Reaction-pH -can affect soil fertility and therefore will affect the types of plants that can be supported by the soil and eventaually the rate of soil formation.

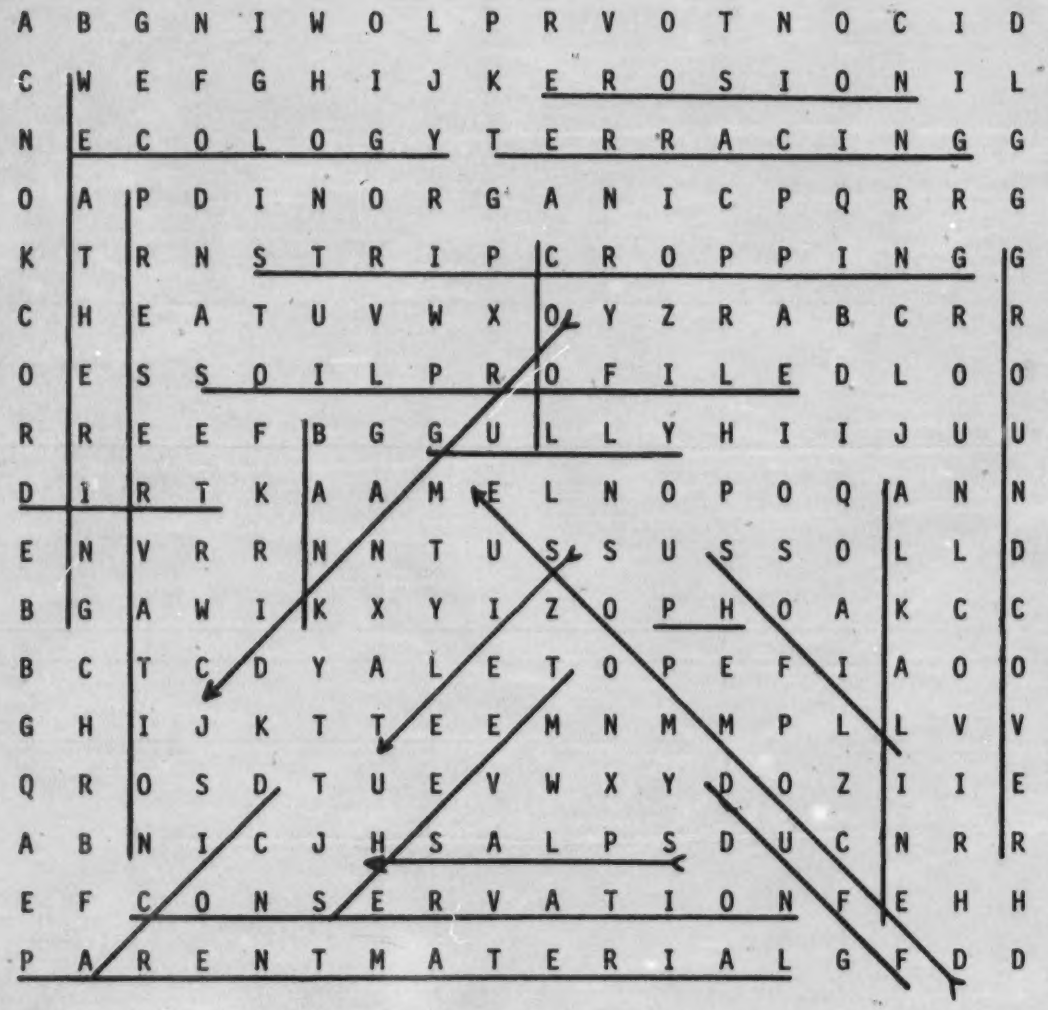
GLOSSARY OF SOIL WORDS

PRESERVATION:	Not using our natural resources, but leaving them as they are.
CONSERVATION:	Wise use of our natural resources so that we save some for future use.
ECOLOGY:	The study of how plants and animals live and work together in their surroundings.
ORGANIC:	Anything that is (alive) living, or has been (alive) living.
INORGANIC:	Anything that has never been living.
DECOMPOSE:	To rot, or to decay.
SOIL:	A mixture of decayed organic material and decomposed rock.
DUFF:	Top layer of soil, the rotting vegetable material that helps to make new soil.
TOPSOIL:	Second layer of soil. Best for plant growth.
SUBSOIL:	Third layer of soil -- gives moisture and minerals to plants.
PARENT MATERIAL:	Bottom layer of soil -- the partly decomposed rocks or sand that help to make new soil.
BEDROCK:	The solid rock -- under the four layers of soil.
SOIL PROFILE:	A side view of the layers of soil.
SAND:	Soil that feels gritty, and does not hold together.
SILT:	Smooth soil, settles to the bottom of water.
CLAY:	Soil that is smooth and sticky.
pH:	A test that tells what plants you can grow by showing how acid (sour) or alkaline (sweet) the soil is. The soil that tastes sour to plants - measures between 1 and 7 on pH scale and is on the acid side.
ALKALINE:	Soil that tastes sweet to plants -- measures between 7 and 14 on pH scale.
WEATHERING:	The breaking down of rocks and minerals.
EROSION:	The wearing away of soil by water or wind.

GLOSSARY OF SOIL WORDS (cont.)

SHEET EROSION:	Washes away the layers of soil.
RILL EROSION:	Washes away the soil by water running downhill and making many little streams.
GULLY EROSION:	Washes away the soil by water running downhill and making deep, wide ditches.
BANK EROSION:	Erosion is caused by streams washing away the soil from stream banks.
SPLASH EROSION:	Is caused by raindrops hitting bare soil.
GROUND COVER:	Grasses, plants, shrubs or trees preventing the soil from being worn away by wind or water.
STRIP CROPPING:	Planting rows of different crops to hold the soil together against erosion.
CONTOUR PLOWING:	Plowing across a hill, instead of straight up and down it, to prevent erosion.
TERRACING:	Plowing across a hill and making stairs out of the soil to prevent erosion.

WORD FIND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FIND EACH OF YOUR SOIL VOCABULARY WORDS IN THE WORD FIND ABOVE, WORDS ARE FORWARDS, BACKWARDS, AND DIAGONAL.

GOOD LUCK!!!

UNSCRAMBLE THESE SOIL VOCABULARY WORDS

DUSTY TOPL	(study plot)	CAINGOR	(organic)
DNAS	(sand)	ROSENI ROSLENCUD	(senior counselor)
HEETS	(sheet)	ACYL	(clay)
GREHNITAEW	(weathering)	RETAW	(water)
ROODUTO CLOHOS	(outdoor school)	GIWNOPL OORUNCT	(contour plowing)
LSIBUOS	(subsoil)	RACERGINT	(terracing)
LYULG	(gully)	INJUOR LUCOSNERO	(junior counselor)
GYLCEOLO	(ecology)	NILMASA	(animals)
REFMAPCI	(campfire)	LOSI LIFEROP	(soil profile)
PIRTS PROPGINC	(strip cropping)	PHASSL	(splash)
ERFIDNS	(friends)	SAVENERRPITO	(preservation)
NOSEOIR	(erosion)	LIST	(silt)
FUDF	(duff)	GANNCIIOR	(inorganic)
SEEPOOMED	(decompose)	LIRL	(rill)
CEESRORU LATCISSIPE	(resource specialist)	TISE ROSSERPUVI	(site supervisor)
NCIAB	(cabin)	DACI	(acid)
SLATPN	(plants)	LIPSOOT	(topsoil)
ALLINKE	(alkaline)	TENARP LATERIAM	(parent material)
VESTRANNOOIC	(conservation)	CODKERB	(bedrock)
OILS	(soil)	NUDORG EVROC	(ground cover)
NABK	(bank)		

FARM FUN

or

("HOW TO PLANT THE RIGHT CROP IN THE RIGHT pH AND MAKE A BUNCH OF MONEY")

On the next page there is a picture of a farm. Since this is your workbook, this must be your farm. It's a nice farm, with good land, and you want to plant the best crops so that you will make a lot of money from your farm. Well, so far, you have been very smart --- you have tested the pH of your soil and found that there were five pH ranges on your farm. Now, you have one rather large problem --- you know what you want to plant, but you must plant the crop in the soil with the right pH or that crop won't grow. If the crop doesn't grow --- you are broke! If the crop does grow --- you make a lot of money!!!

Below is a list of crops you want to plant, with a number next to each crop. Plant your crops by writing the number of the crop next to the pH that is best for that crop. Do this with each crop - until you have "planted" all your crops. There is <u>at least</u> one crop for each pH.

After you have planted all your crops, your teacher will read the correct pH for each crop. On the picture of your farm, <u>circle the number</u> of each crop that is planted in the soil with the right pH. Then, count all the numbers you have circled, and this will give you the number of correct answers you have. Each crop that is planted in the right pH is worth $1,000 (because it will grow and you can harvest it). To find out how much money you made, write the number of correct answers you have on the line below, multiply it by 1,000 (or just add 3 zeroes on to the end of the number), and you'll find out how rich you are.

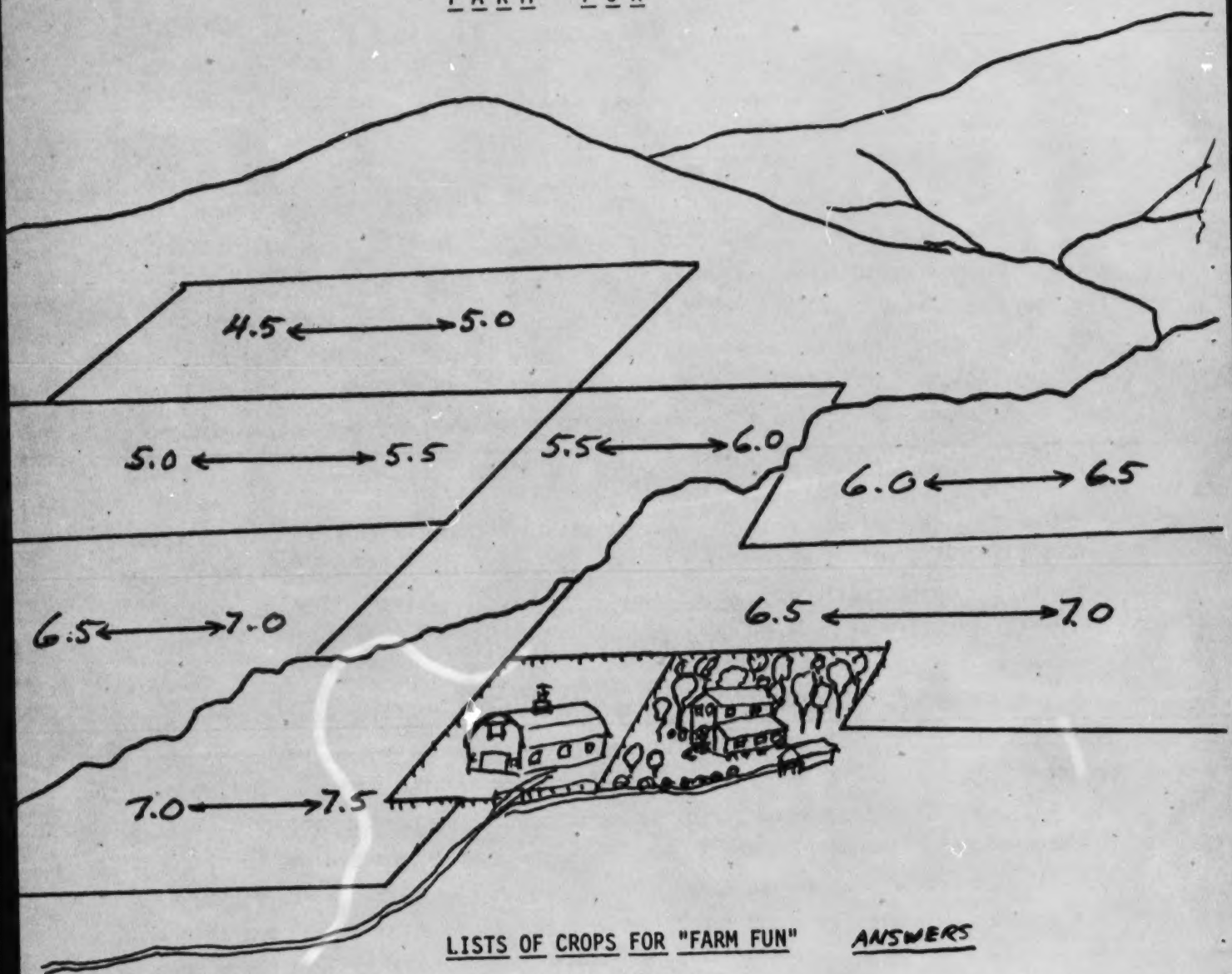
EXAMPLE: <u>25</u> X 1,000 = <u>$25,000</u>

correct answers

YOUR FARM: _____ X 1,000 = _____

correct answers

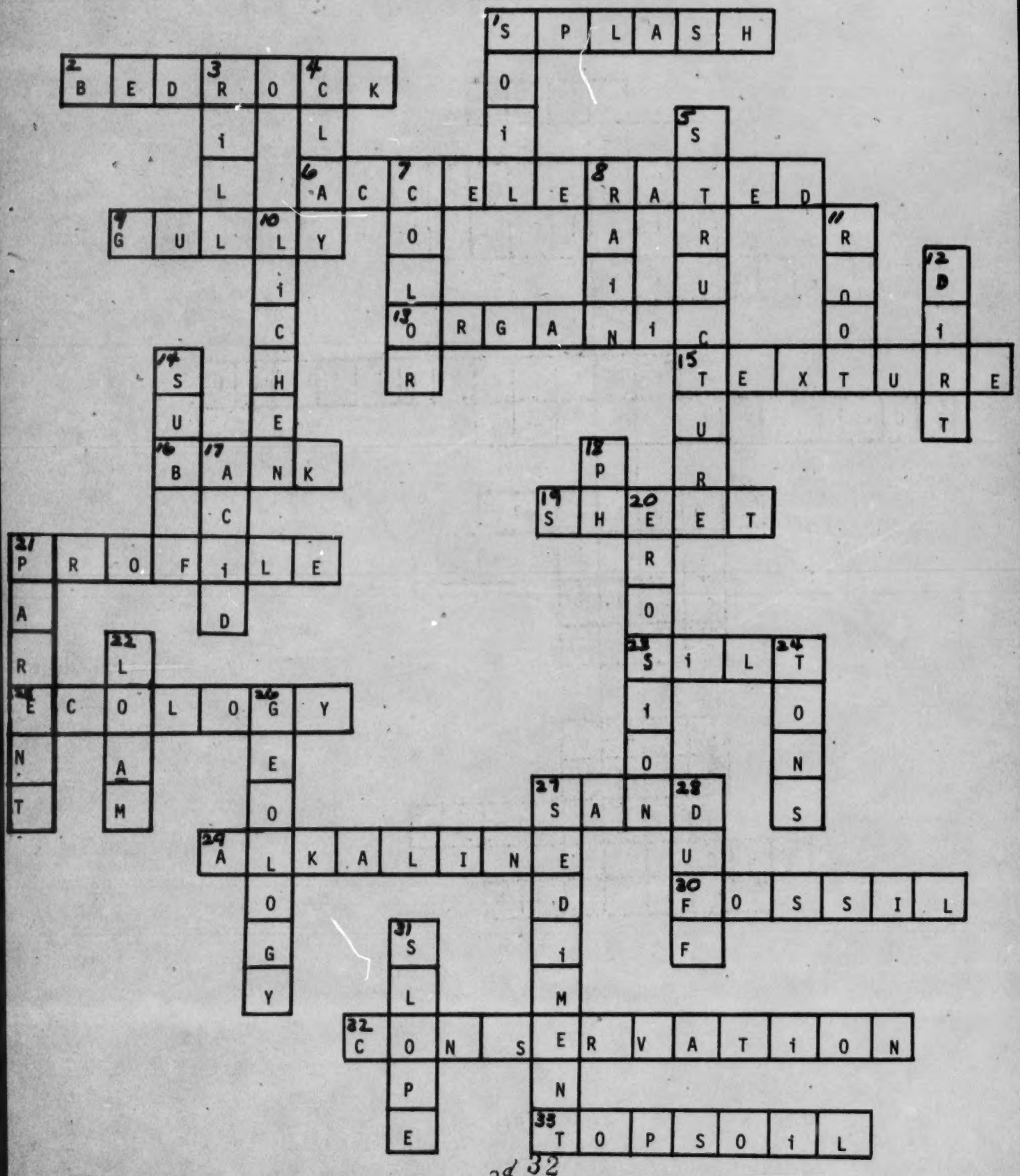
FARM FUN



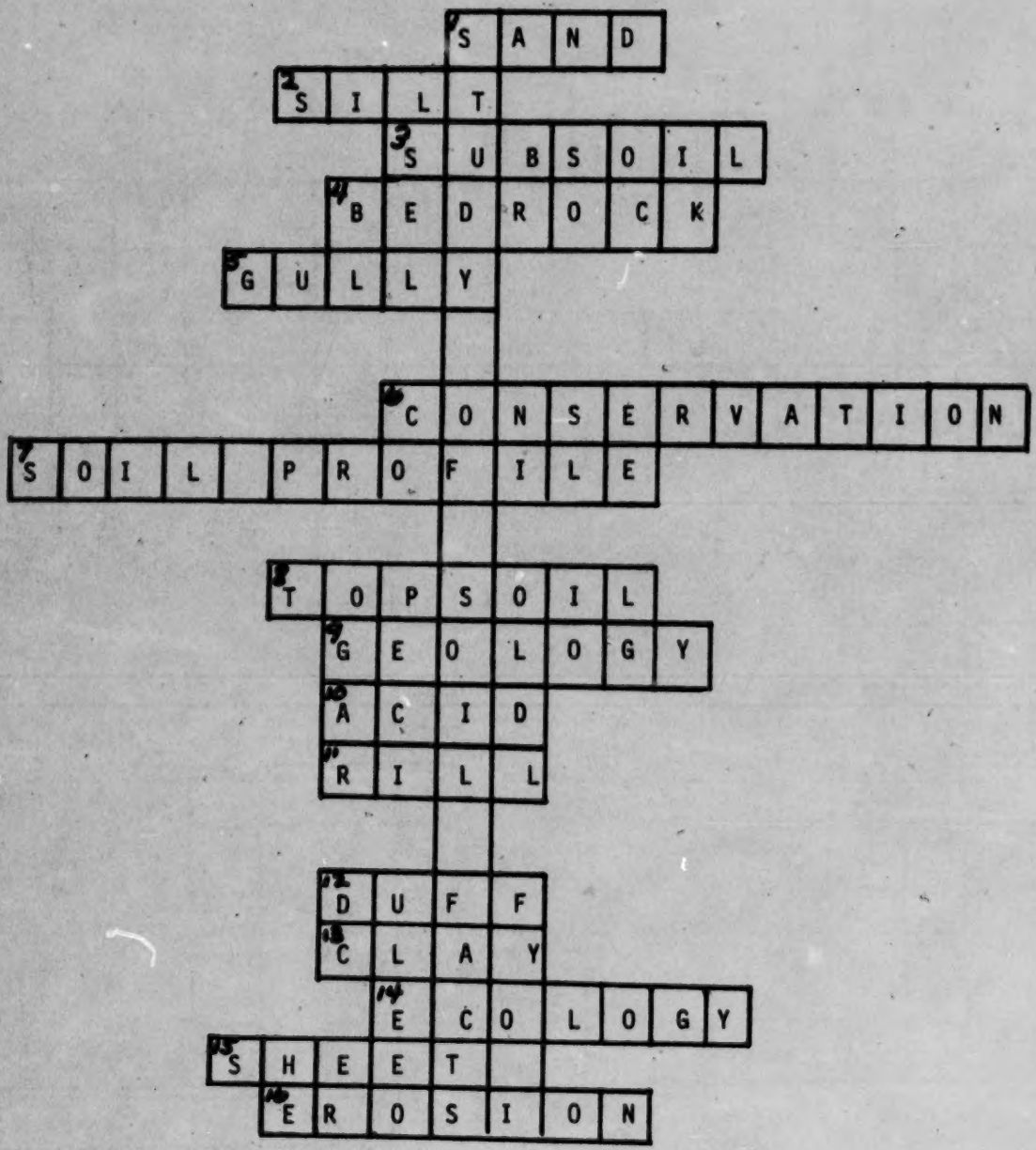
LISTS OF CROPS FOR "FARM FUN" ANSWERS

1. Asparagus - 6.5
2. Corn - 6.25
3. Grapes - 6.0
4. Oats - 6.25
5. Lemon - 6.75
6. Pears - 6.0
7. Apple - 5.75
8. Beets - 6.5
9. Lettuce 6.5
10. Sweet Potatoe 5.25
11. Lime 6.75
12. Potato, White - 5.25
13. Sweet Clover - 7.0
14. Bluberry - 5.0
15. Wheat - 6.25
16. Carrot - 6.5
17. Beans (snap) - 6.0
18. Egg Plant - 5.75
19. Strawberry - 5.75
20. Tomato - 6.0
21. Tobacco - 5.5
22. Barley - 6.25
23. Blackberry - 5.0
24. Alfalfa - 7.0
25. Watermelon - 5.25

SOIL CROSSWORD PUZZLE #1



SOIL CROSSWORD PUZZLE #2



WORD GAMES

(Or a fun and painless way to learn your vocabulary words)

I. SOIL SECRETS

A. Chose one of your soil vocabulary words.

B. Stand in front of the class.

C. One person at a time will ask you a question about your secret word. Answer the question "Yes" or "No".

D. If the answer is "Yes", the same person asks another question. If the answer is "No", a different person asks a question.

E. The class has twenty questions to guess your secret soil word.

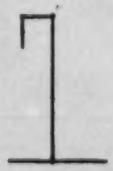
F. Whoever guesses your secret word, is the next person to have a turn.

II. SOIL HANGMAN

A. Draw a picture of a hangman's platform. Draw lines that show the number of letters in the soil word you have chosen.

EXAMPLE: Gully

_ _ _ _ _



B. The class will guess if a certain letter is in the word.

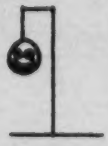
C. If they are right, you write the letter in the space. If they are wrong, you draw the first part of the body, and write the letter on another list.

EXAMPLE: The guess was "A"

LETTERS: A

_ _ _ _ _

WRONG: So draw a head



D. For each wrong guess, you draw a part of the body.

E. If you finish drawing the body before the class guesses all the letters in the word - - - you win!!

III. SOIL JEOPARDY

A. On one side of an index card, write a question about soil. On the other side of the card, write how many points the question is worth, either 5, 10, 15, or 20.

EASIEST QUESTIONS = 5
HARDEST QUESTIONS = 20

EXAMPLE:

Question:	What is the top layer of soil?	Points = 5
Question:	What is the difference between preservation and conservation?	Points = 20
Question:	Name two ways to prevent erosion on a slope.	Points = 15
Question:	What kind of erosion makes deep, wide ditches in the soil?	Points = 10

B. Put the cards with the same number of points into a stack --- so that you have 4 stacks of cards with the questions hidden and the numbers showing.

C. Divide the class into teams.

D. One person in the team asks for either a 5, 10, 15, or 20 point question.

E. Any team member may answer the question.

F. If the answer is right, your team gets the points. If it is wrong, the next team gets a chance to answer the questions.

G. The team with the most points at the end of the game- - - WINS!!!

STUDY OF PLANTS

At Outdoor School one day will be spent studying the plants growing there. You will soon discover that certain plants are usually found associating together, just as you tend to be with your friends and family in a community. Plant communities exist because they share certain physical conditions in their surroundings that agree with that group of plants - and do not agree with others. In another area with another set of conditions, another grouping of plants will grow together in a community. These growth conditions may include the types of soil present, the drainage conditions, moisture conditions throughout the year, the temperature, the elevation, and whether the slope of the land is toward the north or south (exposure to the sun).

You will also notice that plants differ from one another and can be separated or "classified" by means of these differences. The main groups are trees, shrubs, flowering plants, grasses, ferns, mosses, lichens, fungi and algae. Plants grow generally in three levels (1) upper level - 30 feet and above, (2) middle level - from 3 to 30 feet, (3) lower level - below 3 feet. When we are able to classify plants we can then determine which ones grow together in a community, and whether there are plants from other communities that have similar characteristics and are part of the same "family".

Of course, not all plants grow in forests, and in Oregon we also have natural prairies or meadows and a lot of desert country. Much of Oregon contains only lower level plants, but plants grow almost everywhere in our state and in the world. Can you name some areas in the world where plants do not grow? (Possibly the top of Mt. Everest, the middle of the Sahara Desert, on the Polar Ice Cap). Why do you think they won't grow there, at least in abundance?

As you prepare to study plants at Outdoor School start thinking about how important plants are to your life. Can you think of a food which doesn't come from plants? (Yes, but what does the cow eat?) How much paper do you use in a day? What are most things packaged in? How many things around your home or in the classroom are made from plants? What are you wearing? (Yes, but what does the sheep eat?)

In our state of Oregon, forest products are the major source of income for our people, more than in any other state in the union. Trees are a renewable resource as long as we take care of the land and try to understand that trees are only a part of the plant community and that forests give us much more than trees. Can you name some of the many things we get from a forest that are not made of wood? Why do we like to walk in the forest? Where does wildlife live? Where does nature store water for a year-round supply?

GLOSSARY OF PLANT WORDS

ALGAE:	Most primitive form of plant from which all other groups of plants have probably been derived. They vary in size from very small land forms to giant seaweed as long as 150 feet. This is the green material on the side of a fish bowl.
BERRY:	Any small juicy and stoneless fruit.
BUSH:	Any low shrub with many branches.
FERN:	A plant with feather-like leaves which reproduces by spores.
FLOWER:	The part of a plant which contains the organs of reproduction from which seeds develop.
FUNGUS:	Form of plant life which has no chlorophyll so must obtain its food from other living things.
LICHEN:	A plant which consists of two, an algae and a fungus.
MOSS:	A primitive plant form that reproduces by spores instead of seeds.
TREE:	A plant that usually grows tall and which has a trunk and branches.
ALTERNATE:	Leaf pattern - leaves growing first on one side of the stem and then on one side of the stem and then on the other but not across from one another.
BROAD LEAF:	A plant having flat, broad leaves, instead of needles like on pines, firs, etc.
COMPOUND LEAF:	Leaf consisting of several leaflets attached to a single leaf stem.
CONIFER:	A tree which usually is evergreen and has needle shaped leaves. It is a cone bearing tree.
DECIDUOUS:	A plant whose leaves drop off in the fall of the year.
EVERGREEN:	A plant which stays green all year.
INTOLERANT:	A sun loving plant which does poorly in the shade.
OPPOSITE:	Leaf pattern - leaves growing across from one another on a stem.
PALMATE:	A leaf arrangement in which several leaflets start from a single point and form a shape like a hand with fingers.
PINNATE:	Leaf having leaflets arranged opposite each other on two sides of the stem - like a feather.
SIMPLE LEAF:	A leaf which isn't divided.
TEETH:	Projections on the edges of leaves which look like teeth.
WHORLS:	A circular arrangement of leaves on a stem at one point.
BARK:	Protective covering on the outside of a tree or shrub.
CAMBIUM LAYER:	Layer of growing tissue between the bark and the sapwood.
CHLOROPHYLL:	The green coloring matter of plants necessary for the plant to make it's own food. (Photosynthesis)
CONE:	The seed bearing body of such trees as Douglas Fir, Hemlock, Pines, etc.
LOBED:	Leaf having deep indentations between the major veins.

GROWTH RINGS: The amount of wood a tree grows in one year.

HEARTWOOD: The inner core of a tree trunk made of nonliving cells which is usually darker than sapwood. Gives the tree strength.

LEAF: A green, usually flat part of a plant that grows from the stem or roots and is the place where most photosynthesis takes place.

NEEDLE: A thin, pointed leaf, like that of the Douglas Fir.

PETAL: One of the divisions of a flower which is usually brightly colored.

ROOTS: Part of a plant which usually grows in the ground. It anchors the plant and feeds the plant.

SAP: The liquid inside the trunk of a tree.

SAPWOOD: Soft living part of trunk which contains tubes which carry water and minerals from roots to leaves.

SEED: The reproductive part of a flowering plant which contains the egg cell.

SPORES: One-celled seeds found in plants, like ferns.

STEM: The stalk which supports a leaf, flower or fruit.

TRUNK: The main stem of a tree.

CARBON DIOXIDE: Gas which we breathe out and the plant takes in during photosynthesis (daytime).

OXYGEN: Colorless gas that is given off by plants during photosynthesis (daytime).

PHOTOSYNTHESIS: The process by which plants used water, CO_2 and sunlight to make food.

BOARD FOOT: Unit of measuring lumber - 12" x 12" x 1".

CIRCUMFERENCE: Measurement around a circle.

D.B.H. Diameter of tree at breast height (4½ feet).

DIAMETER: Length of a line from one side of a circle to the other through the center.

COMMUNITY: A group of plants growing in the same area and in the same conditions.

DUFF: Decayed organic matter on top of the soil.

NURSE LOG: Decaying log which provides a seed bed for other plants.

PLANT SUCCESSION: One plant community following another.

MIX AND MATCH
PLANT CHARACTERISTICS

Label each of the items below using the following terms:

1. Palmately compound leaf
2. Whorl branched
3. Alternately branched
4. Pinnately lobed leaf
5. Simple leaf
6. Opposite branching
7. Palmately lobed leaf
8. Needle leafed
9. Pinnately compound leaf

NEEDLE LEAFED

SIMPLE LEAF

ALTERNATELY BRANCHED

PALMATELY COMPOUND

WHORL BRANCHED

PINNATELY COMPOUND

OPPOSITE BRANCHED

PALMATELY LOBED

PINNATELY LOBED

UNSCRAMBLE THESE PLANT WORDS

TONSSIHPOYHEST		PHOTOSYNTHESIS
GUSNUF		FUNGUS
LOPHOLCYLRH		CHLOROPHYLL
FUDF		DUFF
FOGSRULDIA	(2)	DOUGLAS FIR
GEERVERNE		EVERGREEN
NATATELER		ALTERNATE
MOELKCH		HEMLOCK
TOPSOPIE		OPPOSITE
PUDMONOC		COMPOUND
KONC		CONK
TOADBOROF	(2)	BOARDFOOT
CUDSIUDEO		DECIDUOUS
LEMPA		MAPLE
RONICESUOF		CONIFEROUS
MAREDIET		DIAMETER
NECO		CONE
SAPNLT		PLANTS
ROUTSOOHCLOOD	(2)	OUTDOOR SCHOOL
WARPAOCMDH	(2)	CAMP HOWARD
KABR		BARK
SROTO		ROOTS
PEERORNGOAG	(2)	OREGON GRAPE

40

MIX AND MATCH

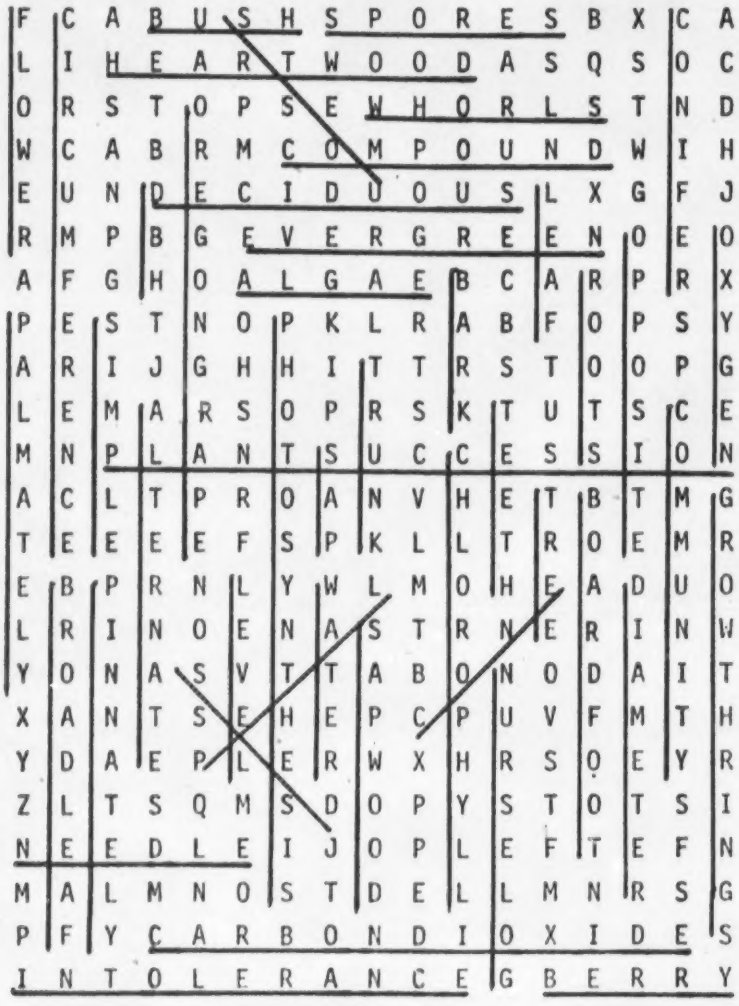
FIND THE DEFINITION ON THE RIGHT WHICH MATCHES THE WORD ON THE LEFT AND WRITE THE LETTER IN THE SPACE PROVIDED.

1.	Photosyntheses S	G.	Dead plant material on top of the ground
2.	Chlorophyll L	P.	Evergreen with droopy top
3.	Douglas Fir H	J.	12 x 12 x 1 inches
4.	Alternate I	C.	Measurement through a circle
5.	Opposite R	K.	Protects a tree
6.	Conk T	N.	Holds seed
7.	Deciduous A	A.	Looses leaves
8.	Coniferous B	R.	Leaves growing across from each other
9.	Cone N	H.	State Tree
10.	Roots D	S.	Plants making food
11.	Bark K	L.	Green material in plants
12.	Oregon Grape E	D.	Anchors the tree
13.	Diameter C	E.	State Flower
14.	Maple D	D.	Seeds are like helicopters
15.	Board Foot J	Q.	A leaf with many leaflets
16.	Compound Q	B.	Trees which have cones
17.	Hemlock P	T.	Hard fungus on side of tree
18.	Evergreen F	I.	Leaves growing on every other side of a stem
19.	Duff G	F.	Trees which stay green all year
20.	Fungus M	M.	A plant which can't make its own food

PLANT WORD FIND

FIND THESE MISSING 46 WORDS THAT ARE WRITTEN VERTICAL, HORIZONTALLY OR DIAGONAL BUT, ALWAYS FORWARD!

CHLOROPHYLL
PHOTOSYNTHESIS
LEAF
TRUNK
ROOTS
BARK
PETAL
STEM
TEETH
COMMUNITY
OREGON GRAPE
FLOWER
LEVEL
ALTERNATE
OPPOSITE
WHORLS
SIMPLE
COMPOUND
PINNATELY
PALMATELY
CARBON DIOXIDE
OXYGEN
NEEDLE
BERRY
CONE
SEED
SAP
NURSE LOG
BOARD FOOT
CIRCUMFERENCE
DIAMETER
GROWTH RINGS
SPORES
WATER
BROAD LEAF
TREE BUSH
ALGAE
CONIFER
EVERGREEN
DECIDUOUS
D.B.H.
HEARTWOOD
SAPWOOD
INTOLERANCE
PLANT SUCCESSION


F C A B U S H S P O R E S B X C A
L I H E A R T W O O D A S Q S O C
O R S T O P S E W H O R L S T N D
W C A B R M C O M P O U N D W I H
E U N D E C I D U O U S L X G F J
R M P B G E V E R G R E E N O E O
A F G H O A L G A E B C A R P R X
P E S T N O P K L R A B F O P S Y
A R I J G H H I T T R S T O O P G
L E M A R S O P R S K T U T S C E
M N P L A N T S U C C E S S I O N
A C L T P R O A N V H E T B T M G
T E E E E F S P K L L T R O E M R
E B P R N L Y W L M O H E A D U O
L R I N O E N A S T R N E R I N W
Y O N A S V T T A B O N O D A I T
X A N T S E H E P C P U V F M T H
Y D A E P L E R W X H R S O E Y R
Z L T S Q M S D O P Y S T O T S I
N E E D L E I J O P L E F T E F N
M A L M N O S T D E L L M N R S G
P F Y C A R B O N D I O X I D E S
I N T O L E R A N C E G B E R R Y

ANIMALS

ALL ANIMALS HAVE THE SAME PRIORITIES:

A- TO STAY ALIVE:

1- To obtain food, water, and shelter.
2- To avoid being eaten.

B- TO REPRODUCE:

1- To find a mate.
2- To provide food, water, and shelter for the young.
3- To protect the young from predators.

In some species, such as most reptiles and amphibians and many of the insects, the care and protection of the young is neglected, but is replaced by having an over-production of young, allowing many of them to die from neglect or being eaten, and still having enough survivors to carry on the species.

The birth rate and the death rate in any species must be equal if the species is to maintain its status. Any kind of animal with a high death rate must have many young, or become extinct; species which raise most of their young to maturity must have few young, or they will increase until they have exhausted their food or shelter. This is called over-population.

In nature, over-population does not often occur, because when a food supply exists, predators will move in to harvest the excess, and each animal is a source of food to some other animal. When mice are abundant the hawks, foxes, weasels, and other animals that eat mice will increase rapidly, as they have plenty of food for their young, and so can have more of them, and, as these young are better fed, more of them will grow up. As the mouse population drops, these predators which eat mice are less inclined to breed, and of those which do breed, fewer of the young will grow up because of starvation, or diseases brought about by malnutrition. Also, when there are fewer mice, the hungry predators will turn to other food, including the young of other predators, and thus decrease their population. Many of them will travel to other places where there is more food, and so help in controlling over-population there.

MAMMALS

When most people speak of animals, what they really mean is MAMMALS. Mammals are the largest of all the animals living today, although they are not nearly as large as some of the reptiles that lived long ago. When you see an animal it is easy to tell if it is a mammal, because all mammals have hair, at least a few hairs, and no animals except mammals have true hair, although some have bristles that somewhat resemble hair, such as the short fibers on some caterpillars. Mammals are warm-blooded vertebrates, bear their young alive, and are the only animals that feed their young on milk.

It would be nice if we could simply walk out and see all of the mammals that live in our woods and fields, but it is not that easy. Mammals are intelligent creatures, and they do not trust people until it has been proved to them that those people are trustworthy. Most wild animals have little contact with man, and what contact they do have is often not at all reassuring to the animal, so animals that have been around people are often more timid than those that have never seen man. Deer are hunted for food and sport; the furbearing animals are killed for their skins; predators, even when the law forbids it, are often shot. Many children and irresponsible adults throw sticks and rocks at animals, or even kill them, for no reason whatever. It is no wonder that animals do not trust man.

When you walk through the woods, many animals are looking at you. Wild animals are camouflaged to escape detection by their enemies, including man, and they remain very still as long as they are aware that you are there. They are not dangerous unless they feel that you are a threat to them. If you would observe wild animals, sit very quietly, they will soon forget your presence and come out of their hiding places, but even then they may be very hard to see because of their protective coloring. This helps food species to elude predators, and helps predators to catch their prey.

B I R D S

In temperate zones we always have birds, but not necessarily the same kinds of birds at all times of the year. Most of the birds that nest here in the spring and summer go south to spend the winter in a warmer climate, while the birds that nest farther north come to spend the winter with us. This movement is called MIGRATION, and the birds that move about in this way are called MIGRANTS, and are said to MIGRATE. Some birds that live in the high mountains move to lower elevations to avoid the heavy snows of winter.

Early in the spring the males of many kinds of small birds arrive in the nesting areas, each in search of a suitable place to raise a family. When the first arrival chooses his home, he decides how much space will be needed to provide enough food for his expected family; this determines the boundaries of his TERRITORY. He now selects one or more places to perch while loudly singing to annouce to other birds of his species that this is his property, and trespassers will be prosecuted. Strange as it seems to us, other birds respect his rights and later arrivals choose other places. Soon the female birds arrive and begin their annual shopping around for mates. Just what determines the choice, whether it is personal attraction or posession of the better homesites, is not really known to us, but it is established that the males that arrive after the nesting sites have been occupied do not get mates, and so do not raise young. This is one of nature's ways of keeping the population of a species within the limits of available food. In an area where the food supply is great, the territories will be smaller, and so more birds will find homes. In years of very little food, the territories must be very large, making room for few nests.

BIRDS

If you attend Outdoor School during the spring session, one of your projects might be to locate the territory of a small bird, and try to establish its boundaries, as determined by his singing.

There is no such thing as a perfect home for all birds, as needs differ among species. As we change the use of land, we also change the habitat of the birds and the other animals. When we cut the trees we destroy the homes and food supply of the forest birds, but the grass and bushes that grow with the increased sunlight provide food and homes for other birds. When we clear away these bushes and grasses to plant crops on the land, we again destroy the homes and food supply of birds, but our fields supply still others. Even when we put buildings on the land, some kinds of birds, such as house-sparrows and pigeons will find a home, and will eat the cast-off scraps and the bugs that live with human habitation.

We can often tell what a bird eats by looking at its bill. Seed-eaters have strong bills for cracking seeds; many insect eaters have tiny sharp bills to enter crevises where bugs may be hiding; woodpeckers have strong, chisel-like bills to penetrate the bark of trees to reach the insects and worms working within; flesh-eaters such as hawks and owls have strong, hooked bills for tearing flesh. These are only a few of the many types of bills. When you see a bird, look at his bill and try to guess what he eats.

Through many generations, every part of the bodies of birds, as well as their habits, become adapted to their way of life. Feet will become webbed, or sharp talons develop through selective breeding. This simply means that the bird that is best fitted to live under these conditions will be a healthier specimen, and will have a better chance to reproduce than one not so well adapted, therefore, the young, having a tendency to be like the parents, will gradually, through generations, become better equipped to meet the demands of their way of life.

BIRDS

We can find many examples of such adaptation. Birds that spend much time in the air, hunting for their food, develop large, strong wings; birds that have no need to fly, as the ostrich, sometimes lose their wings almost altogether, or have such tiny weak wings that flight would not be possible. A few birds, such as the swift, spend so much time in the air that they have lost their ability to walk. Many water birds, excellent swimmers, and beautiful in the air, are so clumsy when walking that we have a special word, "waddle", to express scorn for their appearance on land.

Birds that cannot escape from predators because of their bright colors, or because they are too slow, or too big and clumsy, or because they have no means of defending themselves, are soon eaten, and so have little chance to reproduce. In this way, nature slowly improves each species, or causes it to become extinct.

If you would like to become familiar with a few birds before attending Outdoor School, a good picture book, such as Marshall's "Familiar Birds of Northwest Forests, Fields, and Gardens" or Peterson's "Field Guide to Western Birds" will give you the help that you need. The birds found at Outdoor School will vary with the season, and whether you are attending a site near farm land, or a river, or in a deep forest, but the following birds will probably be found at all sites, both spring and fall;

Robin
Song Sparrow
Oregon Junco
Black-capped Chickadee
Chestnut-backed Chickadee
Rufous-sided Towhee
Assorted Warblers
Winter Wren
Rufous Hummingbird
Common Bushtit
Red-breasted Nuthatch
White-breasted Nuthatch
Brown Creeper
Woodpeckers
Steller's Jay
Common Crow
Turkey Vulture
Red-tailed Hawk
Great Horned Owl
Ruffed Grouse

REPTILES & AMPHIBIANS

REPTILES: snakes, lizards, turtles, alligators

AMPHIBIANS: frogs, toads, salamanders

The cold-blooded vertebrates (animals with backbones) fall into two main groups, REPTILES, and AMPHIBIANS.

It is easy to tell to which group an animal belongs, by the skin. The skin of reptiles is dry and scaly, the skin of amphibians is smooth and moist. Often people describe snakes as slimy: this is a mistake. Snakes, lizards, and turtles, being reptiles, are always dry unless dampened by rain or other water, and, even then, they do not remain wet for long, as their scales do not hold moisture.

The skin of amphibians usually feels moist to the touch, but even they are never slimy. After handling a frog or salamander, there is no slime on ones hands, they are perfectly clean. Slimy is a term that describes fish, slugs, and snails, but never reptiles or amphibians.

Many people feel a great dislike for all cold-blooded creatures. This is probably because they are so unlike ourselves, but actually, most reptiles and amphibians are entirely harmless, and do a great deal of good.

All of the reptiles and amphibians that we have in Oregon are small. Their food consists of insects and other small animals such as mice, rats, slugs, frogs, and other creatures that have a very high reproduction rate, and therefore tend to over-populate if left undisturbed.

Both reptiles and amphibians lay eggs, although some reptiles retain the eggs within the body of the female until they hatch, giving the effect of bearing the young alive. Young reptiles, when they hatch, look like their parents except for size. Reptiles lay their eggs on land, even those like the turtle and alligator which live in water, and the young must make their own way to water. Throughout their life, they are air breathers, and must come to the surface for oxygen.

REPTILES & AMPHIBIANS

Amphibians lay their eggs in water, and the young, when they hatch, are very unlike their parents. Usually they resemble small worms, they have no legs, and they breathe with gills, as fish do. Later they develop legs and lungs. At this time they either move entirely to land, or live in water but must go to the surface to breathe. An example of this that we have all seen is the tadpole that becomes a frog. The tadpole lives in water, and breathes with gills. Later he develops legs and lungs, loses his tail, and becomes a frog. The young of amphibians eat algae, a plant scum that they scrape from plant stems and other submerged surfaces. Later they eat animal food, much as reptiles do.

As we travel about our Outdoor School study area we will observe the reptiles and amphibians, but we must not disturb them more than is necessary. Snakes, frogs, and lizards have their home territories as other animals do, and to move them needlessly is to cause disturbance to them as well as to other animals into those territories we move them. Those creatures that we do hold in captivity for study purposes should never be mistreated, and any animal that is taken for any reason should be returned to the area in which it was found as soon as it is no longer needed.

Although one poisonous snake, the rattlesnake, is quite common in some parts of Oregon, it is not found at or near any of our Outdoor School sites. We have no poisonous snakes.

THE INSECT

The place that the insect occupies in the world of living things is important because most all plants and animals are affected in some way by their presence. Two-thirds or more of all kinds of animals on this earth are insects. They are individually outnumbered only by microscopic forms of life. Over 9000,000 different kinds have been identified and experts believe this may be only 10% of the insects yet to be discovered.

Insects play a very important role in our lives because some are pests and others are beneficial. While the common fruit-fly can destroy thousands of dollars worth of cherries in Oregon each year, we would not have any cherries, or apples, or grapes, or clover without the bees and similar insects.

All insects have six legs and only six. The body of an insect is divided into three regions, the head, thorax, and abdomen. The three pairs of legs are found on the thorax and an insect may or may not have wings. The insect is protected and held together by a suit of armor called the exoskeleton. It has no inside skeleton like a human. The insect breathes, not through his mouth or nose like a mammal, but through holes in his body wall.

In 1951 crop losses due to insects were estimated at $10,200,000,000 for the United States alone where over $400,000,000 is spent each year to keep insects under control.

Why is there such a problem with the "little" insect? It is mainly because of the insect's unbelievable potential to multiply. A good example is the common cabbage aphid found in almost any garden. A single female aphid averages 45 offspring per generation and there are usually 12 generations a year. Starting with a single female and assuming all the offspring of each generation survive and each offspring produce 45 more aphids, in one year (12 generations), 822,250 tons of aphids would be produced. Fortunately all aphid offspring don't survive and those that do, are kept in check by Man.

KREEPY KRITTERS

Insects, spiders, centipedes, etc. (as well as clams, crabs, etc) have what is known as an exoskeleton (Greek, exo, without or outwards; skeletos, hard), a hard outer sheath that serves as a skeleton, gives shape and rigidity to the body, acts as armor to prevent injury from without, and prevents loss of water by evaporation. There is a limit to the size that an animal having an exoskeleton can be, as this type of muscle attachment will not work on a very large muscle. Not being surrounded by living tissue the skeleton cannot grow, therefore, the animal can grow only a very little within its shell. It is then necessary to shed its covering and to replace it with a larger one. This process, repeated many times in the growth of the animal, is called moulting. Early in the moulting process, the animal becomes immobilized while his old coat loosens. It then splits down the back and he crawls out of it but he is very soft and unable to travel far until his new shell hardens. At this time he is extremely vulnerable.

Most Kreepy Kritters give no care whatever to their young, depending entirely on over-production to perpetuate the species. Some females lay more than a million eggs in their lifetime. Such over-production is balanced in nature by birds, reptiles, fish, amphibians, and mammals as well as by other Kreepy Kritters who depend on bugs for food. Some birds eat hundreds of insects in a single day. Anything that destroys these insect eaters will allow bugs to multiply at an almost unbelievable rate. The increase is compounded by several thousand with each generation and some insects have another generation every few days. Some species that care for their young and therefore have a relatively high survival rate prevent over-population by having one Queen who lays all of the eggs for the colony. All other females are sterile, and few males are produced.

CENTIPEDES (latin, centum, hundred; pedis, foot) flattened, segmented animals with one pair of legs on each of from 14 to 180 segments; the front pair usually modified into poisoned claws with which to inject venom into their prey. Can be painful, but rarely fatal to humans.

KREEPY KRITTERS

MILLEPEDES (latin, mille, thousand; pedis, foot) are slow moving with rounded bodies and numerous segments, each with two pairs of legs. Short antennae. Usually found on decaying vegetable matter.

SOWBUGS have a jointed OVAL body, two antennae. Some sowbugs can curl into a ball, their shell protecting their legs and gills, and are often called "Pill-bugs". Sometimes one that doesn't curl will be found to be a female carrying eggs in a brood sac formed by flat projections from her legs. The young resemble the adults. Eat vegetable matter.

SCORPIONS are near relatives of spiders, have four pairs of legs, the front pair modified into pincers. The long, flexible abdomen ends with a poisoned stinger. They eat mostly insects and hunt at night, hiding under rocks or other dark places by day. After a long and elaborate mating ceremony, about 60 young are born alive and are carried on the mother's back for about a week.

TERMS USED IN ANIMAL STUDY

This list is not intended to be used as a dictionary, but rather as an aid to improving your vocabulary before attending Outdoor School: The terms are not in alphabetical oder, but are in related groups, each group small enough to be easily learned. In the definitions, the words in CAPITAL LETTERS are important things to remember.

VERTEBRATES:	Animals with BACKBONES.
INVERTEBRATES:	Animals WITHOUT BACKBONES. Some have exoskeletons.
EXOSKELETON:	The OUTSIDE SKELETON of animals such as insects and crayfish.

VERTEBRATES

MAMMAL:	Warm-blooded vertebrate, HAIR, FEEDS YOUNG ON MILK.
BIRD:	Warm-blooded vertebrate, FEATHERS, eggs with limey shells.
REPTILE:	Cold-blooded vertebrate, DRY, SCALY SKIN, (snake, lizard, turtle)
AMPHIBIAN:	Cold-blooded vertebrate, SKIN SMOOTH & SLIPPER (frog, salamander)

INVERTEBRATES WITH EXOSKELETONS

INSECT:	THREE PART BODY, SIX LEGS, adults usually have wings.
SPIDER:	TWO PART BODY, EIGHT LEGS, no wings.
CENTIPEDE:	Exoskeleton in many sections, each section having 2 legs (1 pair)
MILLEPEDE:	Exoskeleton in many sections, each section having 4 legs (2 pair)

INVERTEBRATES WITHOUT EXOSKELETONS

SNAIL & SLUG:	NO SKELETON, SLIMY, ONE LONG, FLAT FOOT, with or without shell.
EARTHWORM:	NO SKELETON, SLIMY, long segmented body, no legs.

CARNIVORES:	Animals that eat meat.
HERBIVORES:	Animals that eat plants.
OMNIVORES:	Animals that eat both meat and plants.
PREDATORS:	Animals that kill other animals for food.
SCAVENGERS:	Animals that eat dead and decaying animal and plant life.
PARASITES:	Animals or plants that obtain food from living organisms.

DIURNAL:	Most active during daylight hours.
NOCTURNAL:	Most active at night.

HIBERNATE: To spend the winter in a deep sleep usually because of cold.
ESTIVATE: To spend the summer in a deep sleep usually because of drouth.

AQUATIC: Living or growing in water, applied to either plants or animals.
TERRESTRIAL: Living or growing on land, either plants or animals.

NATIVE: An animal or plant naturally found in this area.
EXOTIC: An animal or plant NOT NATIVE to this area (imported).

ENVIRONMENT: All those factors which make up the surroundings of any living thing.

HABITAT: The environment in which an animal can exist, providing all of the things that the animal must have, WATER, FOOD, & SHELTER.

CARRYING CAPACITY: The greatest number of animals that can live in an area.

LIMITING FACTOR: Whichever of the three essentials, WATER, FOOD, or SHELTER is used up first, thus limiting the carrying capacity.

PROTECTION FROM ENEMIES

Some animals have developed special parts or organs that they can use to protect themselves or their homes from enemies. Can you match the name of the animals with their means of defense?

1.	E	SKUNK	A. POISON FANGS
2.	F	BEES	B. SHELL COVERING
3.	A	RATTLESNAKE	C. ANTLERS
4.	B	SNAIL	D. SPINES
5.	G	COW	E. BAD-SMELLING FLUID
6.	C	DEER	F. STINGERS
7.	D	PORCUPINE	G. HORNS
8.	H	DOG	H. TEETH
9.	J	CAT	I. TALONS
10.	I	HAWK	J. SHARP TEETH AND CLAWS

UNSCRAMBLE - ANIMAL WORDS

THESE WORDS ARE FROM YOUR "GLOSSARY OF ANIMAL WORDS" LIST.

DIPRES — SPIDER

LAMAMM — MAMMAL

DEETPINCE — CENTIPEDE

GLUS — SLUG

RADLUIN — DIURNAL

BIIPHAANM — AMPHIBIAN

RIDB — BIRD

TISSEPAAR — PARASITES

MORTHWEAR — EARTHWORM

TIXOCE — EXOTIC

TANNMUIR — RUMINANT

AESTREBREVT — VERTEBRATES

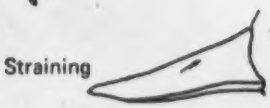
ROOVSINEM — OMNIVOROUS

NECTIS — INSECT

NOXSEOKEETL — EXOSKELETON

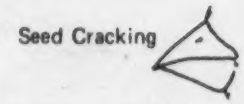
ANIMAL ADAPTATION

Flesh eating



Straining

Insect Catching



Seed Cracking

Chiseling

Ground Walking

Tree Climbing

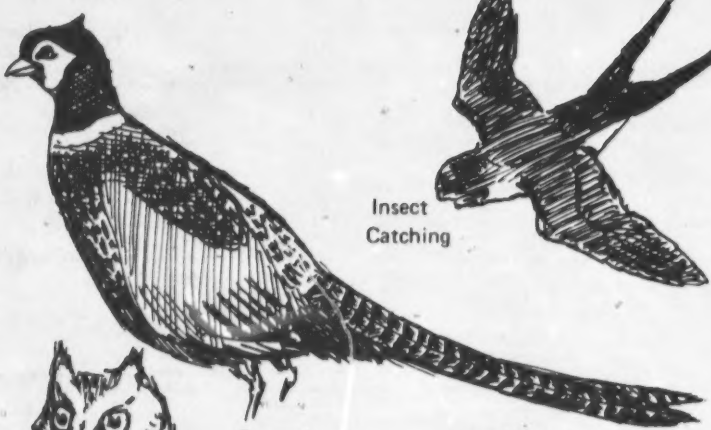
Perching

"BIRD MIND—BOGGLER"

Draw the right beak and foot with each bird.

Grasping and Killing

Swimming



Ground Walking

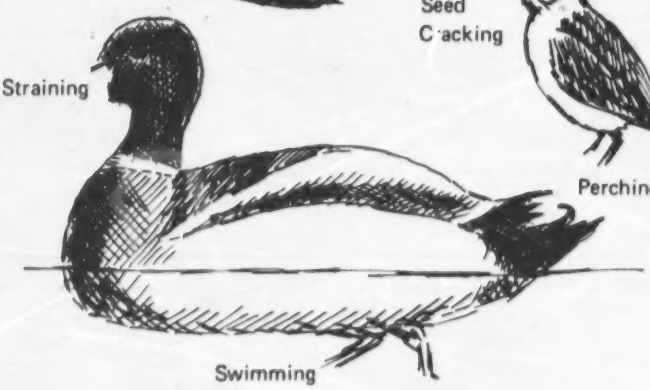
Insect Catching

Chiseling

Tree Climbing

Flesh Eating

Grasping & Killing



Straining

Swimming

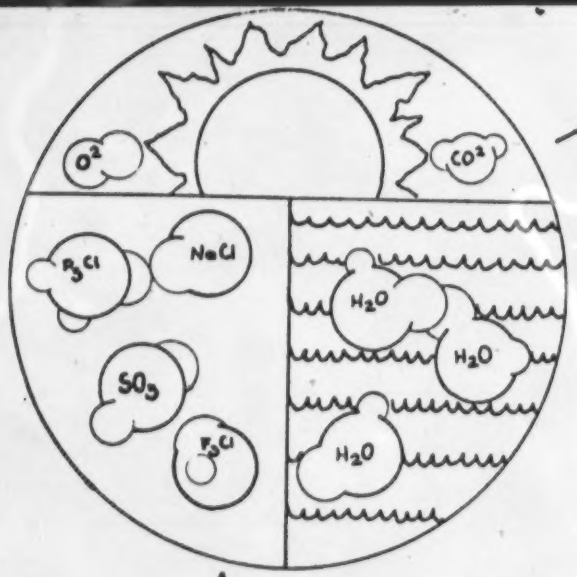
Seed Cracking

Perching

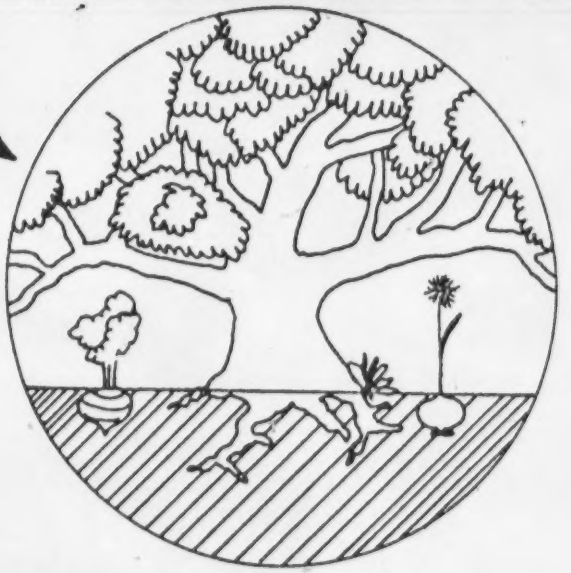
TEST YOURSELF ON YOUR ANIMAL KNOWLEDGE: FILL IN THE BLANKS, using the names of animals that are found at Outdoor School if you can. Most of these questions could have several correct answers.

1. A mammal that has become extinct in Oregon. CAMEL, BISON, WOLF, GRIZZLY BEAR
2. An exotic animal that has become a pest in Oregon. POSSUM, STARLING, NUTRIA, ENG. SPARROW
3. A mammal that digs holes in the ground in which to live. GROUND SQUIRRELS, BADGER, FOX, MTN. BEAVER
4. A mammal that digs holes in which to store food. TREE SQUIRRELS, GROUND SQUIRRELS, DOGS, GOPHERS
5. A mammal that never digs holes. DEER, ELK, COW, HORSE, SHEEP
6. A mammal that climbs trees to gather seeds for food. WEASEL, SQUIRREL, CHIPMUNK, CATS
7. A mammal that climbs trees for shelter. MICE, SQUIRRELS, RACCOONS, POSSUM
8. A mammal that never climbs trees. RABBIT, DEER, ELK, COW, HORSE
9. A reptile that eats mice. SNAKES, LIZARDS
10. A mammal that eats bushes. DEER, GOAT, RABBIT, BEAVER
11. A mammal that eats crayfish and fresh-water clams. RACCOON, OTTER, MINK
12. A bird that eats insects from under tree bark. WOODPECKERS
13. A bird that eats dead and rotting animals. VULTURE, EAGLE, RAVEN, CROW, MAGPIE
14. A bird that will eat almost anything. CROW, RAVEN, STARLING, JAY
15. A bird that looks blue in bright light but black in shade. STELLAR'S JAY
16. A bird that lives ONLY in evergreen forests. THRUSHES—VARIED & SWAINSON'S
17. A bird that kills many rats and mice. OWLS & HAWKS
18. A mammal that walks on its toenails. DEER, ELK, SHEEP, COW, GOAT, HORSE
19. An animal whose tracks look like a baby's hand print. RACCOON
20. An animal that has six legs. INSECT
21. An animal that has eight legs. SPIDER
22. An animal with a smooth, moist, but not slimy, skin. AMPHIBIAN—FROG, SALAMANDER
23. An animal with a dry, scaly skin. SNAKE, LIZARD, ALLIGATOR, TURTLE
24. A four-legged animal that plants trees. SQUIRREL—BURIES NUTS & SEEDS

ECOSYSTEM



Non Living Matter



Producers

Consumers

Decomposers

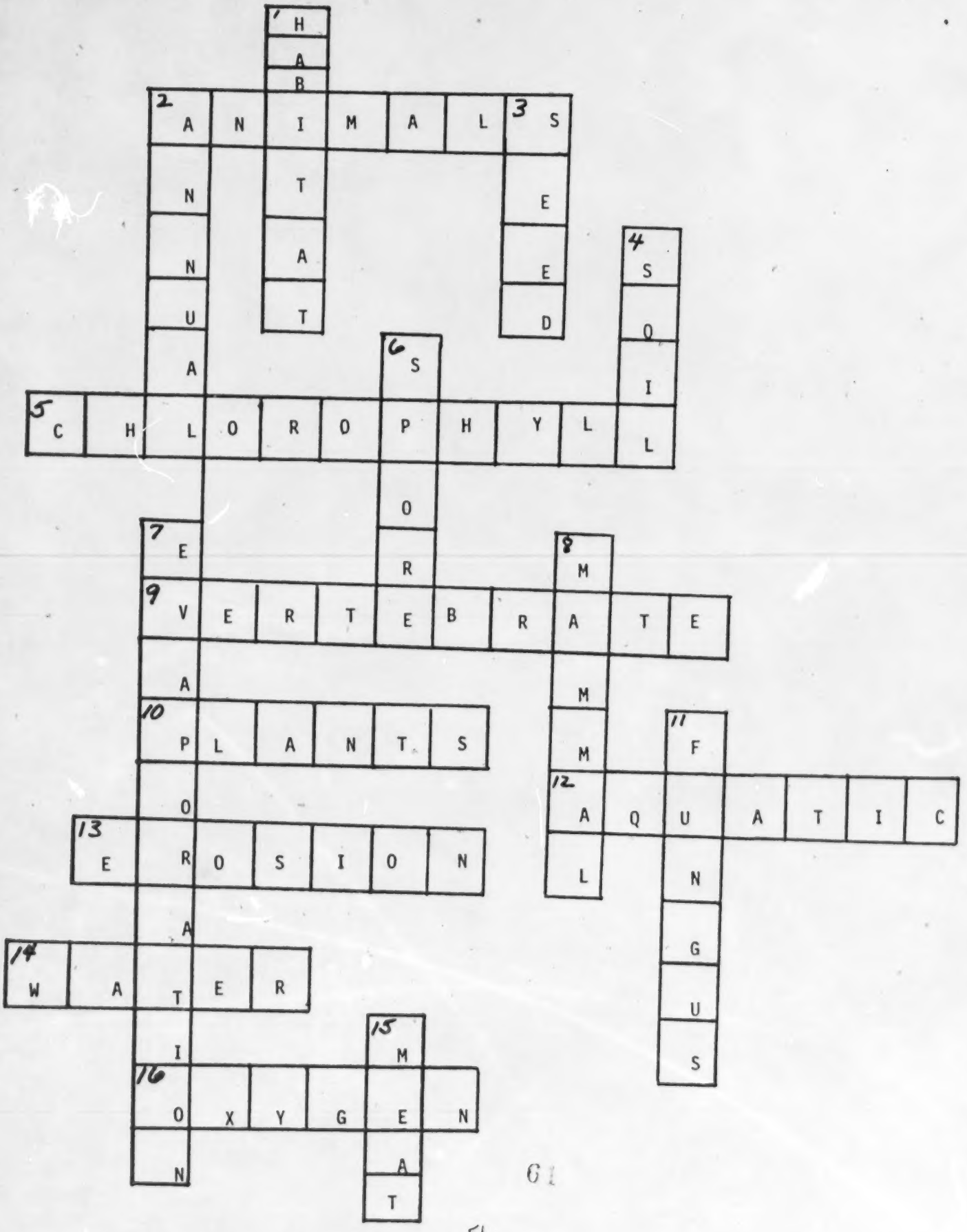
An ecosystem is the sum total of all living and non-living parts supporting a chain of life within a selected area. The interaction of the four following links is critical in the functioning of an ecosystem. Any change in one link is bound to affect the others. This web-like relationship is the essence of the ecology of an area.

1. Non-living matter - The sunlight, water, oxygen, CO_2, soil with the organic compounds and mineral nutrients, used by plants for growth.

2. The Plants (Producers) - convert CO_2 and a water solution in a process called photosynthesis into organic compounds required both by themselves and other organisms in the ecosystem. Plants are our primary source of renewable wealth.

3. The Consumers - Higher organisms that feed on the Producers. Herbivores such as cows and sheep are primary consumers as are many insects. Carnivores, man and such animals as the coyote and lion feed upon herbivores and are the secondary Consumers. (Omnivores feed on both plants and animals.)

4. The Decomposers - Bacteria, fungi and insects close the system when they break down the dead Producers and Consumers and return their chemical compounds to the soil for re-use in plants.


1 H A B
2 A N I M A L
3 S E E D
4 S O I L
5 C H L O R O P H Y L L
6 S O R
7 E
8 M M M
9 V E R T E B R A T E
10 P L A N T S
11 F
12 A Q U A T I C
13 E R O S I O N
14 W A T E R
15 M E A T
16 O X Y G E N
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BINGO QUESTIONS

THESE QUESTIONS ARE THE TERMS ON THE FOUR BINGO CARDS IN THE STUDENT'S WORKBOOK THEY ARE DESIGNED TO BE CUT-OUT, SO THAT YOU MAY DRAW THEM INDIVIDUALLY FROM A CONTAINER WHILE PLAYING BINGO WITH YOUR CLASS.

TEACHER

WHAT IS A MIXTURE OF DECAYED ORGANIC MATERIAL & CRUSHED ROCK? soil	A pH OF 1.0 TO 7.0 is _____ acid	WHAT IS THE WORD THAT MEANS "WEARING AWAY THE SOIL BY WIND OR WATER? erosion	AT OUTDOOR SCHOOL YOU SIT AND SING SONGS AROUND A _____ campfire	WHAT IS THE WORD THAT MEANS "TO ROT OR TO DECAY?" decompose
WHAT IS THE TOP LAYER OF SOIL? duff	THE BOTTOM LAYER OF SOIL IS CALLED _____ parent material	ANYTHING THAT HAS NEVER BEEN LIVING IS _____ inorganic	WHAT MAKES DEEP, WIDE DITCHES AS IT WASHES AWAY THE SOIL? gully erosion	AT 9:30 A.M. EACH DAY OF OUTDOOR SCHOOL, YOU GO TO YOUR _____ study plot
WHAT IS "PLOWING ACROSS A HILL AND MAKING STAIRS" CALLED? terracing	WHAT IS THE SECOND LAYER OF SOIL? top soil	WHAT DO WE CALL SOIL THAT FEELS GRITTY AND WON'T HOLD TOGETHER? sand	THE PERSON WHO WILL TEACH YOU ABOUT SOIL IS CALLED A _____ resource specialist	AT OUTDOOR SCHOOL YOU STUDY WATER, SOIL, ANIMALS, AND _____ plants
WHAT IS THE STUDY OF HOW PLANTS & ANIMALS LIVE & WORK TOGETHER? ecology	A TEST THAT USES A SCALE OF 1 TO 14 IS CALLED _____ pH	WHAT IS SOIL THAT IS SMOOTH AND STICKY? clay	WHAT KIND OF EROSION IS CAUSED BY RAINDROPS HITTING THE BARE SOIL? splash erosion	THE PERSON WHO RUNS THE CAMP AT OUTDOOR SCHOOL IS CALLED THE _____ site supervisor
AT OUTDOOR SCHOOL, YOU LIVE IN A _____ cabin	AT OUTDOOR SCHOOL, YOU MEET MANY PEOPLE AND MAKE LOTS OF NEW _____ friends	A pH OF 7.0 TO 14.0 IS _____ alkaline	AT OUTDOOR SCHOOL, YOU STUDY PLANTS, WATER, SOIL, AND _____ animals	WHAT IS CALLED WHEN WE LEAVE OUR NATURAL RESOURCES AS THEY ARE? preservation
ANYTHING THAT IS LIVING OR HAS BEEN LIVING IS _____ organic	THE BREAKING DOWN OF ROCKS AND MINERALS IS _____ weathering	WHAT IS THE SOLID ROCK UNDERNEATH THE FOUR LAYERS OF SOIL? bedrock	WHAT DO YOU CALL PLANTING ROWS OF DIFFERENT CROPS TO PREVENT EROSION? strip cropping	THE PERSON WHO HELPS THE RESOURCE SPECIALIST ON THE STUDY PLOT IS CALLED A _____ senior counselor
WHAT DO YOU CALL "PLOWING ACROSS A HILL INSTEAD OF UP AND DOWN"? contour plowing	PLANTING TREES OR SHRUBS TO HOLD THE SOIL TOGETHER IS CALLED _____ ground cover	WHAT MAKES LITTLE STREAMS AS IT WASHES AWAY THE SOIL? rill erosion	WHAT KIND OF EROSION WASHES AWAY THE SOIL FROM STREAM BANKS? bank erosion	WISE USE OF OUR NATURAL RESOURCES IS CALLED _____ conservation
WHAT DO YOU CALL A PICTURE OF SOMETHING THAT LIVED IN THE PAST THAT YOU FIND IN ROCKS? fossil	WHAT IS THE THIRD LAYER OF SOIL? subsoil	WHAT IS A VIEW OF THE FOUR LAYERS OF SOIL CALLED? soil profile	WHAT KIND OF EROSION WASHES AWAY THE LAYERS OF SOIL? sheet erosion	SMOOTH SOIL THAT SETTLES TO THE BOTTOM OF WATER IS CALLED _____ silt
	WHO IS THE HIGH SCHOOL STUDENT IN YOUR CABIN j.c.	WHAT IS THE LIQUID THAT FLOWS IN A STREAM OR RIVER water		

LAND USE PLANNING

GOAL: To develop an awareness of the interrelationship of the natural resources and Man.

THE PROBLEM:

There is a large piece of land, 200 acres in size with woods, wildlife and water. Because of rising taxes, the owners of this land are forced to sell it. Your group has the money to buy the land. Your group must decide what you do with this land if you buy it.

What would <u>your</u> plan do to the:

(a) Plants
(b) Animals
(c) Soil
(d) Water

of the site?

A six person County Land Board will listen to each of the groups and decide which plan is the best for the land, the people and the resources.

THE PLAN MAKING:

On your large sheet of paper, your group will write up your plan.

I. What will you do with this land and how will it help or harm the:

(a) Plants
(b) Water
(c) Animals
(d) Soil

II. What will your group do about:

(a) Pollution
(b) Erosion
(c) Jobs
(d) Recreation
(e) Homes

THE PRESENTATION:

Each group must explain their plan to the County Land Board. The Land Board will vote on the best plan.